

REGIONAL ROUND 1B

TOSS-UP

1. *BIOLOGY Short Answer* An assemblage of nucleic acid and proteins that is an obligate intracellular parasite is called a

ANSWER: VIRUS

BONUS

1. *BIOLOGY Short Answer* The general term for a type of plastid that contains color pigments is

ANSWER: CHROMOPLAST

TOSS-UP

2. *MATH Multiple Choice* Which of the following is not a conic section?

- W) ellipse
- X) hyperbola
- Y) parabola
- Z) sigmoid

ANSWER: Z) SIGMOID

BONUS

2. *MATH Short Answer* What is the area in square meters of a trapezoid that has a height of 4 meters and parallel sides of length 3 and 4 meters?

ANSWER: 14 SQUARE METERS

TOSS-UP

3. *CHEMISTRY Multiple Choice* Which of the following ions will be most likely to form when Selenium ionizes?

- W) Se^{6+} (read as: selenium six plus)
- X) Se^{4+}
- Y) Se^{2-}
- Z) Se^{4-}

ANSWER: Y) Se^{2-}

BONUS

3. *CHEMISTRY Multiple Choice* Which of the following atoms can expand its valence shell when bonding?

- W) nitrogen
- X) carbon
- Y) oxygen
- Z) phosphorus

ANSWER: Z) PHOSPHORUS

TOSS-UP

4. *ASTRONOMY Multiple Choice* The moons of Mars are

- W) very small
- X) similar in size to our Moon
- Y) not in synchronous orbits
- Z) completely made of ice

ANSWER: W) VERY SMALL

BONUS

4. *ASTRONOMY Multiple Choice* The layer which we see as the surface of the Sun is the

- W) core
- X) corona
- Y) chromosphere
- Z) photosphere

ANSWER: Z) PHOTOSPHERE

TOSS-UP

5. *CHEMISTRY Multiple Choice* The enthalpy change is the thermal energy transferred when a change occurs

- W) under constant temperature
- X) under constant pressure
- Y) spontaneously
- Z) non-spontaneously

ANSWER: X) UNDER CONSTANT PRESSURE

BONUS

5. *CHEMISTRY Multiple Choice* The common name for the compound CHCl_3 is

- W) carbon hydrogen trichloride
- X) carbon trichloride
- Y) trichlorocarbide
- Z) chloroform

ANSWER: Z) CHLOROFORM

TOSS-UP

6. *COMPUTER SCIENCE Multiple Choice* The field of computer science in which the goal is to program the computer to mimic intelligent human behavior is

- W) CICS
- X) AI
- Y) ATX
- Z) API

ANSWER: X) AI

BONUS

6. *COMPUTER SCIENCE Short Answer* What is the term for the process employed by most video displays that translates bit-mapped images to scan lines on a screen?

ANSWER: RASTERIZING

TOSS-UP

7. *GENERAL SCIENCE Multiple Choice* The form of pollution that is increasing annually is

- W) air pollution
- X) light pollution
- Y) noise pollution
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

7. *GENERAL SCIENCE Short Answer* What is the branch of geometry concerned with the properties of geometrical objects that are unchanged by continuous deformations such as twisting and stretching?

ANSWER: TOPOLOGY

TOSS-UP

8. *PHYSICS Multiple Choice* An artificial Earth satellite in an elliptical orbit has its greatest centripetal acceleration when it is at what location?

- W) nearest the Earth
- X) farthest from the Earth
- Y) between Earth and the moon
- Z) between Earth and the sun

ANSWER: W) NEAREST THE EARTH

BONUS

8. *PHYSICS Multiple Choice* In a carbon microphone, the change in resistance in the microphone as the sound wave moves the diaphragm back and forth is caused by what change in the carbon resistance?

- W) length
- X) temperature
- Y) voltage
- Z) velocity

ANSWER: W) LENGTH

TOSS-UP

9. *EARTH SCIENCE Multiple Choice* The shape of the magnetosphere is influenced by

- W) the lithosphere
- X) the hydrosphere
- Y) the Van Allen belts
- Z) solar winds

ANSWER: Z) SOLAR WINDS

BONUS

9. *EARTH SCIENCE Multiple Choice* The rock type found covering the largest area of the earth's land surface is

- W) igneous
- X) sedimentary
- Y) metamorphic
- Z) none of the above

ANSWER: X) SEDIMENTARY

TOSS-UP

10. *COMPUTER SCIENCE Short Answer* What is the term for a data communications network that extends over a large geographical area but is typically owned and maintained by a single organization?

ANSWER: WAN (ACCEPT: WIDE AREA NETWORK)

BONUS

10. *COMPUTER SCIENCE Short Answer* What does URL stand for?

ANSWER: UNIFORM RESOURCE LOCATOR

TOSS-UP

11. *MATH Short Answer* The class (or set) of all things that are not members of a given set is the

ANSWER: COMPLEMENT

BONUS

11. *MATH Short Answer* For the quadratic equation $ax^2 + bx + c = 0$, the discriminant is

ANSWER: $B^2 - 4AC$

TOSS-UP

12. *CHEMISTRY Multiple Choice* Which type of solid would have the greatest tendency to shatter upon impact with a hammer?

- W) a metal
- X) a metalloid
- Y) a nonmetal
- Z) an inner transition element

ANSWER: Y) A NONMETAL

BONUS

12. *CHEMISTRY Multiple Choice* Which of the following elements is paramagnetic?

- W) krypton
- X) zinc
- Y) strontium
- Z) francium

ANSWER: Z) FRANCIUM

TOSS-UP

13. *COMPUTER SCIENCE Short Answer* In UNIX what command is used to delete a file?

ANSWER: RM

BONUS

13. *COMPUTER SCIENCE Short Answer* What does the acronym MIME stand for?

ANSWER: MULTIPURPOSE INTERNET MAIL EXTENSIONS

TOSS-UP

14. *CHEMISTRY Short Answer* Substances that when present in small amounts can make reactions occur more rapidly but are not themselves used up during the reaction (or are regenerated during the reaction) are

ANSWER: CATALYSTS

BONUS

14. *CHEMISTRY Multiple Choice* Select the element with the least metallic character.

- W) lanthanum
- X) strontium
- Y) thallium
- Z) germanium

ANSWER: Z) GERMANIUM

TOSS-UP

15. *ASTRONOMY Multiple Choice* Which of the following numbers has the same meaning as 8,670?

- W) $8.67 * 10^3$ (read as: eight point sixty-seven times ten to the third power)
- X) $8.67 * 10^2$
- Y) $8.67 * 10$
- Z) $0.867 * 10^3$

ANSWER: W) $8.67 * 10^3$

BONUS

15. *ASTRONOMY Multiple Choice* A better knowledge of which of the following would most aid us in determining whether the universe is open or closed?

- W) the age of the Earth
- X) the age of the solar system
- Y) the size of the Galaxy
- Z) the average density of the universe

ANSWER: Z) THE AVERAGE DENSITY OF THE UNIVERSE

TOSS-UP

16. *EARTH SCIENCE Multiple Choice* Erathosthenes was able to figure out the circumference of the earth by using

- W) the angle of a shadow
- X) an eclipse of the moon
- Y) meridians and parallels
- Z) a polar map projection

ANSWER: W) THE ANGLE OF A SHADOW

BONUS

16. *EARTH SCIENCE Multiple Choice* The longest units of time in the geologic timetable are

- W) periods
- X) eras
- Y) epochs
- Z) years

ANSWER: X) ERAS

TOSS-UP

17. *GENERAL SCIENCE Short Answer* What is the name for a portion of land that is lower than the surrounding area or the area drained by a river and its tributaries?

ANSWER: BASIN

BONUS

17. *GENERAL SCIENCE Short Answer* Which Greek letter symbolizes density, specific resistance, reflectance, or mass concentration?

ANSWER: RHO

TOSS-UP

18. *BIOLOGY Multiple Choice* A major function of hyaline cartilage is to

- W) decrease the motion between bones and muscles
- X) reduce friction between bones
- Y) send signals throughout the body
- Z) give shape to the body

ANSWER: X) REDUCE FRICTION BETWEEN BONES

BONUS

18. *BIOLOGY Multiple Choice* Which of the following hormones is made by the adrenal medulla?

- W) cortisol
- X) aldosterone
- Y) glucagon
- Z) epinephrine

ANSWER: Z) EPINEPHRINE (ACCEPT: ADRENALIN)

TOSS-UP

19. *GENERAL SCIENCE Multiple Choice* Water scarcity during a period when precipitation is lower than normal and evaporation is higher than normal is called

- W) water stress
- X) aridity
- Y) drought
- Z) desiccation

ANSWER: Y) DROUGHT

BONUS

19. *GENERAL SCIENCE Multiple Choice* The earth's protective ozone layer is located in what layer of the atmosphere?

- W) ionosphere
- X) troposphere
- Y) mesosphere
- Z) stratosphere

ANSWER: Z) STRATOSPHERE

TOSS-UP

20. *CHEMISTRY Multiple Choice* Molecular orbitals lower in energy than those atomic orbitals from which they are formed are

- W) bonding orbitals
- X) antibonding orbitals
- Y) nonbonding orbitals
- Z) lone pairs of electrons

ANSWER: W) BONDING ORBITALS

BONUS

20. *CHEMISTRY Multiple Choice* Select the element with the largest first ionization energy.

- W) sodium
- X) calcium
- Y) chlorine
- Z) technetium

ANSWER: Y) CHLORINE

TOSS-UP

21. *COMPUTER SCIENCE Short Answer* What is the meaning of the domain name extension .mil? (read as: dot-m-i-l)

ANSWER: MILITARY

BONUS

21. *COMPUTER SCIENCE Short Answer* What is the term for the amount of time required for data to be communicated from the hard disk or tape controller to the central processing unit?

ANSWER: TRANSFER RATE

TOSS-UP

22. *MATH Short Answer* Find the value of the summation from $i = 0$ to 4 of the expression i .

ANSWER: 10

BONUS

22. *MATH Multiple Choice* A dihedral angle is formed by the

- W) intersection of two lines
- X) intersection of two curves
- Y) intersection of two parallel lines
- Z) intersection of two planes

ANSWER: Z) INTERSECTION OF TWO PLANES

TOSS-UP

23. *EARTH SCIENCE Short Answer* What theory expresses that sea floor crust forms at mid-ocean ridges and spreads away from those ridges in opposite directions?

ANSWER: SEA FLOOR SPREADING (ACCEPT PLATE TECTONICS)

BONUS

23. *EARTH SCIENCE Multiple Choice* The rate of increase of temperature with depth in the Earth is the

- W) Moho discontinuity
- X) geothermal gradient
- Y) hydrothermal energy
- Z) tectonic slope

ANSWER: X) GEOTHERMAL GRADIENT

TOSS-UP

24. *COMPUTER SCIENCE Short Answer* Eight bits represent a byte of information. What is the name for the ninth bit used for error detection?

ANSWER: PARITY BIT

BONUS

24. *COMPUTER SCIENCE Multiple Choice* An auxiliary file that contains the second-most-recent version of a file bears the extension of

- W) .bak (read as: dot – b – a – k)
- X) .exe
- Y) .bat
- Z) .bmp

ANSWER: W) .BAK

TOSS-UP

25. *CHEMISTRY Short Answer* What rule states that electrons added to atomic orbitals of the same energy will remain unpaired with parallel spins until the subshell is more than half filled?

ANSWER: HUND'S RULE

BONUS

25. *CHEMISTRY Multiple Choice* Which of the following is a metalloid?

- W) carbon
- X) sulfur
- Y) germanium
- Z) iridium

ANSWER: Y) GERMANIUM

REGIONAL ROUND 2B

TOSS-UP

1. *EARTH SCIENCE Multiple Choice* An important development in the rise of reptiles from amphibians was

- W) development of feet
- X) a means for controlling body temperature
- Y) amniotic egg
- Z) development of gills

ANSWER: Y) AMNIOTIC EGG

BONUS

1. *EARTH SCIENCE Multiple Choice* Which of the following is a pluvial lake?

- W) Lake Bonneville
- X) Lake Superior
- Y) Crater Lake
- Z) Lake Pontchartrain (ponch - e - train)

ANSWER: W) LAKE BONNEVILLE

TOSS-UP

2. *GENERAL SCIENCE Short Answer*

What is the term for the interaction between two populations of animals in which members of one population captures, and kills the members of the other for food?

ANSWER: PREDATION

BONUS

2. *GENERAL SCIENCE Short Answer* What is the name for a part of an ocean, sea, or other body of water that extends inland and is smaller than a gulf?

ANSWER: BAY

TOSS-UP

3. *MATH Short Answer* A ladder rests against a wall making a 30 degree angle with the wall. The bottom of the ladder is 10 feet from the wall. How long is the ladder?

ANSWER: 20 FEET

BONUS

3. *MATH Short Answer* At a critical point of a function, the curve of the function has a vertical tangent, and the function has a first derivative of

ANSWER: INFINITY

TOSS-UP

4. *CHEMISTRY Multiple Choice* Transition metals are primarily used

- W) as fuel for nuclear reactors
- X) for transforming metalloids into metals
- Y) as pigmentation in paints
- Z) for structural purposes

ANSWER: Z) FOR STRUCTURAL PURPOSES

BONUS

4. *CHEMISTRY Multiple Choice* The formula of a magnesium ion is

- W) Mg^{2+} (read as: magnesium two plus)
- X) Mg^+ (read as: magnesium plus)
- Y) Mg^{2-} (read as: magnesium two minus)
- Z) Mg^-

ANSWER: W) Mg^{2+}

TOSS-UP

5. *MATH Multiple Choice* A regular polygon constructed by marking off, on the circumference of a circle, chords equal in length to its radius is a

- W) square
- X) pentagon
- Y) hexagon
- Z) heptagon

ANSWER: Y) HEXAGON

BONUS

5. *MATH Short Answer* What is the term for a circle drawn on the surface of a sphere that has the same radius as the sphere and is used to show the shortest distance between two points on the surface

ANSWER: GREAT CIRCLE

TOSS-UP

6. *BIOLOGY Short Answer* What is the term for the movement of minerals and chemical compounds within a plant?

ANSWER: TRANSLOCATION

BONUS

6. *BIOLOGY Short Answer* Name the two types of plankton?

ANSWER: ZOOPLANKTON AND PHYTOPLANKTON

TOSS-UP

7. *ASTRONOMY Multiple Choice* To begin a new nuclear reaction in a star after the hydrogen has burned out requires greater

- W) amounts of hydrogen
- X) amounts of iron
- Y) temperature
- Z) size of the star

ANSWER: Y) TEMPERATURE

BONUS

7. *ASTRONOMY Multiple Choice* The phase of the Moon at the time of lunar eclipse

- W) is full
- X) is new
- Y) is first quarter
- Z) can be any phase

ANSWER: W) IS FULL

TOSS-UP

8. *PHYSICS Multiple Choice* In simple harmonic motion, the acceleration is

- W) Constant
- X) Greatest when velocity is zero
- Y) Greatest when the velocity is greatest
- Z) None of the above

ANSWER: X) GREATEST WHEN VELOCITY IS ZERO

BONUS

8. *PHYSICS Short Answer* The surfaces of a Dewar flask are silvered for the purpose of minimizing heat transfer by what process?

ANSWER: RADIATION

TOSS-UP

9. *BIOLOGY Multiple Choice* Which of the following is NOT a characteristic of the sporozoans?

- W) require two or more different hosts
- X) complex life cycle
- Y) have a free-living stage
- Z) exhibit both sexual and asexual reproduction

ANSWER: Y) HAVE A FREE-LIVING STAGE

BONUS

9. *BIOLOGY Short Answer* What type of viruses that cause their host cell to break open and die?

ANSWER: LYTIC OR CYTOLYTIC

TOSS-UP

10. *ASTRONOMY Multiple Choice* The bands in the atmosphere of Jupiter can be explained by a combination of

- W) cyclonic flow and convection
- X) differentiation and convection
- Y) circulation and differentiation
- Z) convection and rotation

ANSWER: Z) CONVECTION AND ROTATION

BONUS

10. *ASTRONOMY Multiple Choice* When the Moon and Sun are in line with each other and the Earth, a condition results known as

- W) neap tide
- X) flood tide
- Y) ebb tide
- Z) spring tide

ANSWER: Z) SPRING TIDE

TOSS-UP

11. *COMPUTER SCIENCE Short Answer* What is the meaning of the domain name extension .org (read as: dot - o - r - g)?

ANSWER: NONPROFIT ORGANIZATION

BONUS

11. *COMPUTER SCIENCE Multiple Choice* A kilobit is how many bits

- W) 10,000
- X) 100,000
- Y) 1,000
- Z) None of the above

ANSWER: Y) 1,000

TOSS-UP

12. *PHYSICS Short Answer* Acceleration due to gravity on the moon's surface is 1/6th that on Earth. An astronaut's life support backpack weighs 300 lb on Earth. What does it weigh on the moon?

ANSWER: 50LB

BONUS

12. *PHYSICS Short Answer* Two resistors of values 6 and 12 Ohms are connected in parallel. This combination in turn is hooked in series with a 4 Ohm resistor. What is the overall resistance of this combination?

ANSWER: 8.0 OHMS

TOSS-UP

13. *BIOLOGY Short Answer* What is waste product of cellular respiration?

ANSWER: CARBON DIOXIDE

BONUS

13. *BIOLOGY Short Answer* Interruptions in pre-mRNA, or intervening sequences, are called

ANSWER: INTRONS

TOSS-UP

14. *PHYSICS Multiple Choice* The Earth moves about the Sun in an elliptical orbit. As the Earth moves closer to the Sun, which of the following best describes the Earth- Sun system's moment of inertia?

- W) decreases
- X) increases
- Y) remains constant
- Z) decreases, then increases

ANSWER: W) DECREASES

BONUS

14. *PHYSICS Multiple Choice* Somewhere between the Earth and the moon is a point where the gravitational attraction of the Earth is canceled by the pull of the moon. The mass of the moon is 1/81 that of the Earth. How far from the center of the Earth is this point?

- W) 8/9 the way to the moon
- X) 9/10 the way to the moon
- Y) 3/4 the way to the moon
- Z) 80/81 the way to the moon

ANSWER: X) 9/10 THE WAY TO THE MOON

TOSS-UP

15. *BIOLOGY Short Answer* Cellular “digestion” occurs largely in which organelle in the cell?

ANSWER: LYSOSOME

BONUS

15. *BIOLOGY Multiple Choice* The RNA copy of the information transcribed from DNA is called

- W) tRna
- X) mRna
- Y) pRna
- Z) rRna

ANSWER: X) mRNA

TOSS-UP

16. *ASTRONOMY Multiple Choice* Jupiter's moon Io has a surface that is

- W) Covered with active volcanoes
- X) Rocky and covered with craters
- Y) Covered with ice similar to a frozen ocean
- Z) Blocked from our view by dense clouds

ANSWER: W) COVERED WITH ACTIVE VOLCANOS

BONUS

16. *ASTRONOMY Multiple Choice* The thin, kinky, braided ring just beyond the outer edge of the A ring of Saturn is called the

- W) B ring
- X) E ring
- Y) F ring
- Z) K ring

ANSWER: Y) F RING

TOSS-UP

17. *COMPUTER SCIENCE Short Answer* What is the name for intra organizational internets that usually enforce some security measures that hinder outsiders from accessing them?

ANSWER: INTRANETS

BONUS

17. *COMPUTER SCIENCE Multiple Choice* The disk directory containing information on the names, sizes, number of blocks and locations of files on that disk is called

- W) DRAM
- X) directory list
- Y) file allocation table
- Z) groupware

ANSWER: Y) FILE ALLOCATION TABLE

TOSS-UP

18. *EARTH SCIENCE Multiple Choice* Tiny, shrimp like creatures that live in water off Antarctica are called

- W) kelp
- X) oyster
- Y) krill
- Z) salmon

ANSWER: Y) KRILL

BONUS

18. *EARTH SCIENCE Multiple Choice* The crystals that form in slowly cooling magma are

- W) tiny
- X) invisible
- Y) colorful
- Z) large

ANSWER: Z) LARGE

TOSS-UP

19. *ASTRONOMY Multiple Choice* The dark plains on the Moon are

- W) ancient sedimentary basins
- X) deserts
- Y) seas
- Z) flood basalt plains

ANSWER: Z) FLOOD BASALT PLAINS

BONUS

19. *ASTRONOMY Multiple Choice* What is the difference between a meteor and a meteorite

- W) A meteorite is the pit made on the Earth or a planet when a meteor hits
- X) A meteor is the flash of light in the sky. A meteorite is the solid body ending up on the ground
- Y) A meteorite is the flash of light in the sky. A meteor is the solid body ending up on the ground
- Z) A meteorite comes from a comet. A meteor comes from an asteroid

ANSWER: X) A METEOR IS THE FLASH OF LIGHT IN THE SKY. A METEORITE IS THE SOLID BODY ENDING UP ON THE GROUND

TOSS-UP

20. *CHEMISTRY Multiple Choice* Avogadro's Law relates the number of molecules of a gas to its

- W) pressure
- X) temperature
- Y) molar mass
- Z) volume

ANSWER: Z) VOLUME

BONUS

20. *CHEMISTRY Multiple Choice* Rutherford bombarded gold foil with alpha particles and found that a small percentage of the particles were deflected. Which of the following was not accounted for by the model he proposed for the structure of atoms?

- W) the small size of the nucleus
- X) the charge on the nucleus
- Y) the total mass of the atom
- Z) the existence of protons

ANSWER: Y) THE TOTAL MASS OF THE ATOM

TOSS-UP

21. *BIOLOGY Short Answer* In a mammal, the liver converts most ammonia to what substance?

ANSWER: UREA

BONUS

21. *BIOLOGY Short Answer* Starting with heterozygous, pure-breeding parents, and assuming complete dominance, the ratio of dominant to recessive phenotypes in the F1 generation is

ANSWER: 3:1

TOSS-UP

22. *GENERAL SCIENCE Short Answer* What is the name for a strong river of high winds in the upper atmosphere that travels from west to east in middle latitudes?

ANSWER: JETSTREAM

BONUS

22. *GENERAL SCIENCE Short Answer* Name five of the six simple machines that humans use to perform work

ANSWER: SCREW, WHEEL/AXLE, WEDGE, LEVER, INCLINED PLANE, OR PULLEY

TOSS-UP

23. *MATH Short Answer* The non-negative real number equal to a given real number but disregarding its sign is called

ANSWER: ABSOLUTE VALUE

BONUS

23. *MATH Multiple Choice* Find the slope of the line that has y-intercept equal to 3.5 and passes through the point (3,5)

- W) -2
- X) 2
- Y) $\frac{1}{2}$
- Z) $-\frac{1}{2}$

ANSWER: Y) $\frac{1}{2}$

TOSS-UP

24. *EARTH SCIENCE Short Answer* What was the name of Alfred Wegener's super continent?

ANSWER: PANGAEA

BONUS

24. *EARTH SCIENCE Multiple Choice* The A horizon in a soil profile has more of which of the following than the other horizons?

- W) humus
- X) sediments
- Y) nutrients
- Z) all of the above

ANSWER: ALL OF THE ABOVE

TOSS-UP

25. *CHEMISTRY Short Answer* What kind of cation contains an unpaired electron resulting from loss of an electron from a neutral species?

ANSWER: RADICAL

BONUS

25. *CHEMISTRY Multiple Choice* What accounts for the intermolecular forces between CCl_4 molecules?

- W) hydrogen bonding
- X) ionic bonding
- Y) dipole forces
- Z) van der Waals forces

ANSWER: Z) VAN DER WAALS FORCES

REGIONAL ROUND 3B

TOSS-UP

1. *COMPUTER SCIENCE Short Answer* What is the term for the capacity to execute two or more processes over a given span of time?

ANSWER: MULTIPROGRAMMING OR MULTITASKING

BONUS

1. *COMPUTER SCIENCE Multiple Choice* A collection of bookmarks is sometimes referred to as a

- W) hotlist
- X) list of favorites
- Y) bookmark list
- Z) All of the above

ANSWER: Z) ALL OF THE ABOVE

TOSS-UP

2. *BIOLOGY Multiple Choice* In the immune system, T and B are names given to 2 kinds of

- W) erythrocytes
- X) lymphocytes
- Y) thrombocytes
- Z) neutrophils

ANSWER: X) LYMPHOCYTES

BONUS

2. *BIOLOGY Multiple Choice* In a population, a type of selection that acts against the extremes in the phenotype so that the average is favored is this kind of selection

- W) stabilizing
- X) directional
- Y) sexual
- Z) allelic

ANSWER: W) STABILIZING

TOSS-UP

3. *ASTRONOMY Multiple Choice* Radio telescopes need not have finely polished surfaces because

- W) we are not interested in detail in the radio image
- X) the speed of radio waves is less than that of light
- Y) the speed of radio waves is greater than that of light
- Z) radio waves are much longer than light waves

ANSWER: Z) RADIO WAVES ARE MUCH LONGER THAN LIGHT WAVES

BONUS

3. *ASTRONOMY Multiple Choice* The overall composition of Jupiter most nearly resembles:

- W) the Sun
- X) the Earth
- Y) chondrite meteorites
- Z) water ice

ANSWER: W) THE SUN

TOSS-UP

4. *EARTH SCIENCE Multiple Choice* A single boulder standing in a field would most likely have been deposited by

- W) running water
- X) wind
- Y) a glacier
- Z) a mountain

ANSWER: Y) A GLACIER

BONUS

4. *EARTH SCIENCE Multiple Choice* Why did earth scientists begin to change their mind about the theory of continental drift?

- W) they found the San Andreas Fault
- X) they learned about sea floor spreading
- Y) they found fossils of old continents
- Z) they learned about earthquakes in the ocean

ANSWER: X) THEY LEARNED ABOUT SEA FLOOR SPREADING

TOSS-UP

5. *PHYSICS Short Answer* A light bulb has resistance of 240 Ohms when operating at 120 Volts. Find the current in the light bulb (in Amperes).

ANSWER: 0.5 AMPERES

BONUS

5. *PHYSICS Multiple Choice* A weightless spherical balloon is filled with gasoline (density 0.80 grams per cubic centimeter) and placed in seawater (density 1.025 grams per cubic centimeter). The balloon has which of the following percent of its volume under water?

- W) 60%
- X) 68%
- Y) 72%
- Z) 78%

ANSWER: Z) 78%

TOSS-UP

6. *CHEMISTRY Short Answer* The symbol of the element potassium is

ANSWER: K

BONUS

6. *CHEMISTRY Multiple Choice* An f-block element is

- W) Calcium
- X) Cadmium
- Y) Cerium
- Z) Carbon

ANSWER: Y) CERIUM

TOSS-UP

7. *MATH Short Answer* A proposition or subsidiary theorem that follows directly from the statement or the proof of another proposition is a

ANSWER: COROLLARY

BONUS

7. *MATH Short Answer* What are the zeroes of $f(x) = x^4 - x^2$?

ANSWER: X = 0, 1, -1 (ALL THREE ANSWERS ARE REQUIRED)

TOSS-UP

8. *GENERAL SCIENCE Multiple Choice* A motor where alternating current is fed to a stationary coil, which both creates the magnetic field and creates a current in the rotating coil which it surrounds, is what type of motor?

- W) induction
- X) synchronous
- Y) universal
- Z) shunt wound

ANSWER: W) INDUCTION

BONUS

8. *GENERAL SCIENCE Short Answer* What is the term for a layer of sedimentary or igneous rock that has been spread out on or below the earth's surface?

ANSWER: STRATUM (ACCEPT: STRATA)

TOSS-UP

9. *COMPUTER SCIENCE Short Answer* The method of storing and representing color in digital images into the three distinct primary color components or channels is called what?

ANSWER: RGB COLOR SYSTEM (ACCEPT RED, GREEN, BLUE COLOR SYSTEM)

BONUS

9. *COMPUTER SCIENCE Short Answer* What are the three primary Boolean operators?

ANSWER: AND, OR, NOT

TOSS-UP

10. *ASTRONOMY Multiple Choice* Which one of the following does not contribute to modifying the Earth's surface?

- W) wind
- X) chemical processes
- Y) magnetic fields
- Z) water

ANSWER: Y) MAGNETIC FIELDS

BONUS

10. *ASTRONOMY Multiple Choice* The temperature range on the planets in our solar system is approximately

- W) 300 - 500 degrees Kelvin
- X) 0 - 100 degrees Kelvin
- Y) 40 - 700 degrees Kelvin
- Z) 500 - 100,000 degrees Kelvin

ANSWER: Y) 40 - 700 DEGREES KELVIN

TOSS-UP

11. *ASTRONOMY Short Answer* Name the discoverer after which the four large satellites of Jupiter are named?

ANSWER: GALILEO

BONUS

11. *ASTRONOMY Multiple Choice* Which planet's largest moon has an atmosphere?

- W) Jupiter
- X) Earth
- Y) Saturn
- Z) Uranus

ANSWER: Y) SATURN

TOSS-UP

12. *BIOLOGY Multiple Choice* Human erythrocytes are

- W) phagocytic
- X) gas transporters
- Y) ion transporters
- Z) infection fighters

ANSWER: X) GAS TRANSPORTERS

BONUS

12. *BIOLOGY Multiple Choice* Choose the one item from the following list that is NOT true according to our current understanding of membrane structure and function.

- W) a lipid bilayer
- X) molecules can move freely within the plane of the membrane
- Y) phospholipids are neither hydrophilic nor hydrophobic
- Z) some membrane proteins help transport molecules across the membrane

ANSWER: Y) PHOSHOLIPIDS ARE NEITHER HYDROPHILIC NOR HYDROPHOBIC

TOSS-UP

13. *BIOLOGY Multiple Choice* Stretch receptors are found in the

- W) cerebrum
- X) hypothalamus
- Y) lungs
- Z) trachea

ANSWER: Y) LUNGS

BONUS

13. *BIOLOGY Multiple Choice* What human disease, which previously has been successfully treated with antibiotics, has shown a resurgence because of antibiotic-resistant strains?

- W) chicken pox
- X) tuberculosis
- Y) malaria
- Z) influenza

ANSWER: X) TUBERCULOSIS

TOSS-UP

14. *PHYSICS Multiple Choice* A unit commonly used to measure electrical energy is the

- W) ampere-second
- X) kilowatt-hour
- Y) volt-second
- Z) coulomb per second

ANSWER: X) KILOWATT-HOUR

BONUS

14. *PHYSICS Multiple Choice* Which is not an example of approximate simple harmonic motion?

- W) a ball bouncing on the floor
- X) a child swinging on a swing
- Y) a piano string that has been struck
- Z) a car radio's antenna as it waves back and forth

ANSWER: W) A BALL BOUNCING ON THE FLOOR

TOSS-UP

15. *ASTRONOMY Multiple Choice* The kinetic energy of an impacting meteoroid is converted principally into

- W) light
- X) sound
- Y) nuclear radiation
- Z) heat

ANSWER: Z) HEAT

BONUS

15. *ASTRONOMY Short Answer* Venus is the brightest planet in the night sky. Which planet is the second brightest?

ANSWER: JUPITER

TOSS-UP

16. *GENERAL SCIENCE Multiple Choice* A barrel of oil is equivalent to

- W) 31 gallons
- X) 10 gallons
- Y) 42 gallons
- Z) 50 gallons

ANSWER: Y) 42 GALLONS

BONUS

16. *GENERAL SCIENCE Multiple Choice* In measurement of circles and arcs, 60 degrees is equivalent to

- W) 1 minute
- X) 1 sign
- Y) 1 sextant
- Z) 1 quadrant

ANSWER: Y) 1 SEXTANT

TOSS-UP

17. *MATH Multiple Choice* In statistics, degrees of freedom is usually

- W) one more than the number of variables
- X) equal to the number of variables
- Y) one less than the number of variables
- Z) undefined

ANSWER: Y) ONE LESS THAN THE NUMBER OF VARIABLES

BONUS

17. *MATH Short Answer* Express the decimal number 22 in Base 16

ANSWER: 16

TOSS-UP

18. *BIOLOGY Short Answer* The diffusion of water across a selectively permeable membrane is called

ANSWER: OSMOSIS

BONUS

18. *BIOLOGY Multiple Choice* Carrier proteins are involved in a process called

- W) phagocytosis
- X) pinocytosis
- Y) facilitated diffusion
- Z) osmosis

ANSWER: Y) FACILITATED DIFFUSION

TOSS-UP

19. *COMPUTER SCIENCE Short Answer* What does HTML stand for?

ANSWER: HYPERTEXT MARKUP LANGUAGE

BONUS

19. *COMPUTER SCIENCE Short Answer* What is the term for graphic images in which the image is composed of lines, curves and figures that are defined mathematically, rather than composed of pixels?

ANSWER: VECTOR GRAPHICS OR OBJECT-ORIENTED GRAPHICS

TOSS-UP

20. *PHYSICS Multiple Choice* Which of the following is an example of a vector quantity?

- W) velocity
- X) temperature
- Y) volume
- Z) mass

ANSWER: W) VELOCITY

BONUS

20. *PHYSICS Multiple Choice* The moment of inertia for a solid, uniform disk or cylinder whose axis is through the center is expressed as

- W) mass x R^2
- X) $\frac{2}{5}$ mass x R^2
- Y) $\frac{1}{2}$ mass x R^2
- Z) 2 mass x R^2

ANSWER: Y) $\frac{1}{2}$ MASS x R^2

TOSS-UP

21. *MATH Short Answer* A step-by-step procedure by which an operation can be carried out without need for deductive reasoning, for example by a machine, is called

ANSWER: ALGORITHM

BONUS

21. *MATH Multiple Choice* A real function $y = f(x)$ (read: y equal f of x) is continuous at a point "a" if and only if it is defined at $x = a$ and the limit as x approaches a of $f(x)$ equals

- W) $f(x - a)$
- X) $f(x + a)$
- Y) $f(a \cdot x)$ (read as: f of a times x)
- Z) $f(a)$

ANSWER: Z) F (A)

TOSS-UP

22. *BIOLOGY Short Answer* The two most abundant gases in inhaled air are

ANSWER: NITROGEN AND OXYGEN

BONUS

22. *BIOLOGY Multiple Choice* Oxygen and carbon dioxide are transported through the alveolar wall by

- W) active transport
- X) diffusion
- Y) endocytosis
- Z) pulmonary transport

ANSWER: X) DIFFUSION

TOSS-UP

23. *GENERAL SCIENCE Short Answer* What is the name for the practice of accurately measuring and recording the relative altitudes, angles, and distances of features on, above, or below the land surface from which maps can be plotted?

ANSWER: SURVEYING

BONUS

23. *GENERAL SCIENCE Short Answer* What is the name for the outer layer of skin in animals?

ANSWER: EPIDERMIS

TOSS-UP

24. *PHYSICS Short Answer* A person on a bridge attached to a bungee cord would be advised to know which law of physics relating to the bungee before he jumps?

ANSWER: HOOKE'S LAW

BONUS

24. *PHYSICS Multiple Choice* According to the second law of thermodynamics, which of the following applies to the heat received from high temperature reservoir by a heat engine operating in a complete cycle?

- W) must be completely converted to work
- X) equals the entropy increase
- Y) converted completely into internal energy
- Z) cannot be completely converted to work

ANSWER: Z) CANNOT BE COMPLETELY CONVERTED TO WORK

TOSS-UP

25. *MATH Short Answer* The method of assigning ordered number pairs to points in a plane is named after the seventeenth century mathematician and philosopher

ANSWER: RENE' DESCARTES (ACCEPT: DESCARTES)

BONUS

25. *MATH Multiple Choice* The conjunction, of P and Q, where P is true and Q is false, is

- W) true
- X) false
- Y) could be either true or false
- Z) neither true or false

ANSWER: X) FALSE

REGIONAL ROUND 4B

TOSS-UP

1. *CHEMISTRY Multiple Choice* The sample containing the largest number of molecules is

- W) 25 grams NH_3
- X) 25grams N_2H_4
- Y) 15 grams NH_2CONH_2
- Z) 25 grams $(\text{NH}_4)_2\text{SO}_4$

ANSWER: W) 25 grams NH_3

BONUS

1. *CHEMISTRY Multiple Choice* In line formulas, each line represents a

- W) carbon atom
- X) hydrogen atom
- Y) atom other than carbon
- Z) bond between atoms

ANSWER: Z) BOND BETWEEN ATOMS

TOSS-UP

2. *ASTRONOMY Multiple Choice* A light year is defined as

- W) the speed of light in a vacuum
- X) the average distance from the Earth to the Sun
- Y) the length of the Solar Year
- Z) the distance light travels in one year

ANSWER: Z) THE DISTANCE LIGHT TRAVELS IN ONE YEAR

BONUS

2. *ASTRONOMY Multiple Choice* Which of the following was created earliest in the Universe?

- W) electrons
- X) the Sun
- Y) helium nuclei
- Z) the Milky Way galaxy

ANSWER: W) ELECTRONS

TOSS-UP

3. *MATH Multiple Choice* Which of the following correlation coefficients between two random variables indicate the greatest correlation?

- W) 0.71
- X) 0.32
- Y) -0.83
- Z) -0.38

ANSWER: Y) -0.83

BONUS

3. *MATH Multiple Choice* At what value of x does the following function have a removable discontinuity, the quantity $x + 1$ squared divided by the quantity $x^2 - 1$

- W) 2
- X) -1
- Y) 1
- Z) -2

ANSWER: X) -1

TOSS-UP

4. *CHEMISTRY Multiple Choice* Helium and beryllium are both the second elements in their respective intervals. They are not placed directly above and below each other in the periodic table because they

- W) have different atomic masses
- X) have a different number of protons
- Y) do not have similar properties
- Z) are arranged alphabetically

ANSWER: Y) DO NOT HAVE SIMILAR PROPERTIES

BONUS

4. *CHEMISTRY Multiple Choice* The arrangement of the electrons in an atom or ion can be shown by any of the following except

- W) a complete electron configuration
- X) an shortened electron configuration
- Y) the first ionization energy
- Z) an orbital diagram

ANSWER: Y) THE FIRST IONIZATION ENERGY

TOSS-UP

5. *BIOLOGY Short Answer* Where in the body are red blood cells produced?

ANSWER: BONE MARROW

BONUS

5. *BIOLOGY Short Answer* What hormone stimulates uterine contractions during childbirth?

ANSWER: OXYTOCIN

TOSS-UP

6. *CHEMISTRY Multiple Choice* If the temperature of a gas is increased from 200 degrees Kelvin to 400 degrees Kelvin, the average speed of the individual gas molecules will increase by a factor of

- W) 1.41
- X) 4
- Y) 8
- Z) 2

ANSWER: W) 1.41

BONUS

6. *PHYSICS Multiple Choice* When the compression of a spring is doubled, the potential energy stored in the spring is

- W) doubled
- X) halved
- Y) quadrupled
- Z) unaffected

ANSWER: Y) QUADRUPLED

TOSS-UP

7. *COMPUTER SCIENCE Multiple Choice* What is a hyperlink?

- W) a string of clickable text or a click able graphic that points to another Web page or document
- X) a software tool used to view Web pages
- Y) an entity on the Internet that publishes Web pages
- Z) none of the above

ANSWER: W) A STRING OF CLICK ABLE TEXT OR A CLICK ABLE GRAPHIC THAT POINTS TO ANOTHER WEB PAGE OR DOCUMENT

BONUS

7. *COMPUTER SCIENCE Multiple Choice* A CD-ROM currently has almost how many times the capacity of a standard floppy disk?

- W) 20
- X) 100
- Y) 400
- Z) 10000

ANSWER: Y) 400

TOSS-UP

8. *GENERAL SCIENCE Short Answer* What is the common name for a mixture of gaseous hydrocarbons such as methane, ethane, and propane that is found in porous sedimentary rock in the earth's crust?

ANSWER: NATURAL GAS

BONUS

8. *GENERAL SCIENCE Short Answer* What is the term used to describe the way light is reflected off of a mineral's surface?

ANSWER: LUSTER

TOSS-UP

9. *ASTRONOMY Multiple Choice* Which of the following objects has the largest diameter?

- W) globular cluster
- X) white dwarf
- Y) the Local group
- Z) red giant star

ANSWER: Y) THE LOCAL GROUP

BONUS

9. *ASTRONOMY Multiple Choice* After a star becomes a red giant, hydrogen burning

- W) does not occur
- X) occurs in the center of the core
- Y) occurs in a shell
- Z) occurs only during a nova

ANSWER: Y) OCCURS IN A SHELL

TOSS-UP

10. *EARTH SCIENCE Multiple Choice* What holds mercury in a column in a mercury barometer?

- W) heavy mercury
- X) mercury pressure
- Y) air pressure
- Z) the weight of mercury

ANSWER: Y) AIR PRESSURE

BONUS

10. *EARTH SCIENCE Short Answer* What large, flat areas of sediment cover much of the deep ocean basin?

ANSWER: ABYSSAL PLAINS

TOSS-UP

11. *BIOLOGY Short Answer* Aquatic animals excrete nitrogenous wastes in the form of

ANSWER: AMMONIA (accept NH_3)

BONUS

11. *BIOLOGY Short Answer* What neurotransmitter is secreted at the neuromuscular junction?

ANSWER: ACETYLCHOLINE

TOSS-UP

12. *ASTRONOMY Multiple Choice* In studying the large Galilean satellites of Jupiter, we see that the density of the moons decreases and the albedo increases as we go from the inner moons to the outer moons. This tells us

- W) the inner moons are mainly ice
- X) the outer moons are mainly ice
- Y) the inner moons are the largest
- Z) the outer moons are the largest

ANSWER: X) THE OUTER MOONS ARE MAINLY ICE

BONUS

12. *ASTRONOMY Multiple Choice* The spectral class of the Sun is G2, and that of the star Enif is K2. From this information, we know with certainty that Enif is

- W) intrinsically brighter than the Sun
- X) hotter than the Sun
- Y) cooler than the Sun
- Z) intrinsically fainter than the Sun

ANSWER: Y) COOLER THAN THE SUN

TOSS-UP

13. *EARTH SCIENCE Multiple Choice* Smooth, flat sides on the surface of a crystal are called crystal

- W) faces
- X) angles
- Y) patterns
- Z) properties

ANSWER: W) FACES

BONUS

13. *EARTH SCIENCE Short Answer* Which layer of Earth is made of iron and nickel in liquid form?

ANSWER: OUTER CORE

TOSS-UP

14. *CHEMISTRY Multiple Choice* The following formula that does NOT represent a stable ionic compound is

- W) MgO
- X) PbCl₂
- Y) Sr₂O
- Z) CsBr

ANSWER: Y) Sr₂O

BONUS

14. *CHEMISTRY Short Answer* An anion in which an element, usually a nonmetal, is bonded to one or more oxygen atoms is called a

ANSWER: OXYANION

TOSS-UP

15. *BIOLOGY Multiple Choice* A cell or individual with an abnormal number of chromosomes is said to be

- W) teratological
- X) hominid
- Y) aneuploid
- Z) homozygous

ANSWER: Y) ANEUPLOID

BONUS

15. *BIOLOGY Multiple Choice* Which of the following is not a common characteristic of mollusks?

- W) radial symmetry
- X) visceral mass
- Y) mantle
- Z) nephridia

ANSWER: W) RADIAL SYMMETRY

TOSS-UP

16. *ASTRONOMY Multiple Choice* Mercury has a high surface temperature because of its

- W) strong greenhouse effect
- X) proximity to the Sun
- Y) elongated orbit
- Z) rapid rotation

ANSWER: X) PROXIMITY TO THE SUN

BONUS

16. *ASTRONOMY Multiple Choice* The orbits of short period comets are

- W) circular
- X) mainly located near the ecliptic
- Y) randomly oriented with respect to the ecliptic
- Z) almost identical to Pluto's orbit

ANSWER: X) MAINLY LOCATED NEAR THE ECLIPTIC

TOSS-UP

17. *MATH Short Answer* The property of a mathematical operator to yield the same results irrespective of the order of arguments, such as $a + b = b + a$, is called

ANSWER: COMMUTATIVE

BONUS

17. *MATH Short Answer* What is the slope and y-intercept of the line $3x + 4y = 5$? (read: 3x plus 4y equals 5)

ANSWER: SLOPE = $-3/4$; Y-INTERCEPT = $5/4$

TOSS-UP

18. *PHYSICS Multiple Choice* According to Newton's second law, the angular acceleration experienced by an object is directly proportional to

- W) its moment of inertia
- X) the net applied torque
- Y) the object's size
- Z) none of the above

ANSWER: X) THE NET APPLIED TORQUE

BONUS

18. *PHYSICS Multiple Choice* The pressure and volume of an ideal gas can double, when the temperature is changed how?

- W) doubled
- X) halved
- Y) quadrupled
- Z) quartered

ANSWER: Y) QUADRUPLED

TOSS-UP

19. *CHEMISTRY Short Answer* Who was the first scientist to propose that the atom had a dense nucleus that occupied only a small fraction of the volume of the atom?

ANSWER: RUTHERFORD

BONUS

19. *CHEMISTRY Multiple Choice* Which of the following gases will be the slowest to diffuse through a room?

- W) methane
- X) hydrogen sulfide
- Y) carbon dioxide
- Z) water

ANSWER: Y) CARBON DIOXIDE

TOSS-UP

20. *BIOLOGY Multiple Choice* Three polypeptide chains wound around each other form a type of secondary protein structure called a

- W) isomeric coil
- X) collagen helix
- Y) alpha helix
- Z) beta sheet

ANSWER: X) COLLAGEN HELIX

BONUS

20. *BIOLOGY Short Answer* What did Jacob and Monod call a stretch of DNA that includes several genes under coordinated control?

ANSWER: OPERON

TOSS-UP

21. *PHYSICS Short Answer* One end of a steel bar is in a Bunsen flame and the other end in an ice cube. By what factor is the rate of heat flow changed when the bar's cross-sectional area is doubled?

ANSWER: TWO

BONUS

21. *PHYSICS Multiple Choice* There are six books in a stack, each with a weight of 5 N. The coefficient of friction between all the books is 0.2. With what horizontal force must I push to start sliding the top five books off the bottom one?

- W) 1.0 N
- X) 5.0 N
- Y) 3.0 N
- Z) 7.0 N

ANSWER: X) 5.0 N

TOSS-UP

22. *CHEMISTRY Short Answer* In a single atom, what is the maximum number of electrons which can have quantum number $n=4$?

ANSWER: 32

BONUS

22. *CHEMISTRY Multiple Choice* The size of an atomic orbital is associated with

- W) the principal quantum number
- X) the angular momentum quantum number
- Y) the magnetic quantum number
- Z) the spin quantum number

ANSWER: W) THE PRINCIPAL QUANTUM NUMBER

TOSS-UP

23. *COMPUTER SCIENCE Short Answer* What does the acronym CD-ROM stand for?

ANSWER: COMPACT DISC READ-ONLY MEMORY

BONUS

23. *COMPUTER SCIENCE Short Answer* What is the term used to describe the main Web page that acts as the container for frames?

ANSWER: FRAMESET

TOSS-UP

24. *MATH Short Answer* What is the probability of flipping a coin 3 times and getting: first a head, then two tails?

ANSWER: 1/8

BONUS

24. *MATH Short Answer* The next Fibonacci number in the sequence of integers 0, 1, 1, 2, 3, 5, 8, 13, is

ANSWER: 21

TOSS-UP

25. *BIOLOGY Short Answer* The rings in the wall of the trachea are made from what material?

ANSWER: CARTILAGE

BONUS

25. *BIOLOGY Multiple Choice* Which of the following is a way that cells regulate the expression of genes?

- W) post-transcriptional control
- X) post-translational control
- Y) translational control
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

REGIONAL ROUND 5B

TOSS-UP

1. *ASTRONOMY Multiple Choice* Following the end of hydrogen nuclear reactions in the core of a star, which nuclear reaction may begin next?

- W) helium to carbon
- X) silicon to iron
- Y) oxygen to nitrogen
- X) wind to water

ANSWER: W) HELIUM TO CARBON

BONUS

1. *ASTRONOMY Multiple Choice* The Earth's atmosphere shields us from most radiations. The exceptions are

- W) visible light and radio waves
- X) x-rays and U-V radiation
- Y) only visible light frequencies
- Z) x-rays and gamma rays

ANSWER: W) VISIBLE LIGHT AND RADIO WAVES

TOSS-UP

2. *PHYSICS Short Answer* What term best describes a system made up of ice, water, and steam existing together?

ANSWER: TRIPLE POINT

BONUS

2. *CHEMISTRY Multiple Choice* An airplane flying with a constant velocity flies from a cold air mass into a warm air mass. The Mach number will

- W) increase
- X) decrease
- Y) stay the same
- Z) become unstable

ANSWER: X) DECREASE

TOSS-UP

3. *BIOLOGY Multiple Choice* The main function of the neuron is

- W) conduction
- X) contraction
- Y) protection
- Z) secretion

ANSWER: W) CONDUCTION

BONUS

3. *BIOLOGY Short Answer* A group of genetically identical cells or organisms derived from a single "parent" cell is called a

ANSWER: CLONE

TOSS-UP

4. *GENERAL SCIENCE Short Answer* What is the term for the cold woodlands located along the southern fringes of the Arctic tundra?

ANSWER: TAIGA

BONUS

4. *GENERAL SCIENCE Short Answer* What is the name for the scientific study of fossilized pollen, spores, and other micro-fossils?

ANSWER: MICROPALAEONTOLOGY OR PALYNOLOGY

TOSS-UP

5. *ASTRONOMY Multiple Choice* Which of the following characteristics of Mercury indicate that it should not have an atmosphere

- W) slow rotation
- X) small mass
- Y) fast orbital speed
- Z) presence of a magnetic field

ANSWER: X) SMALL MASS

BONUS

5. *ASTRONOMY Multiple Choice* Which of the following molecules is found in the spectrum of Uranus, Neptune, and Pluto?

- W) methane
- X) carbon dioxide
- Y) water vapor
- Z) nitrogen

ANSWER: W) METHANE

TOSS-UP

6. *EARTH SCIENCE Short Answer* What is the meaning of the term "strata"?

ANSWER: LAYERED ROCKS (ACCEPT: ROCK LAYERS)

BONUS

6. *EARTH SCIENCE Multiple Choice* The water on a wet-bulb thermometer will evaporate quickly and cool the bulb quickly when the relative humidity is

- W) high
- X) low
- Y) condensed
- Z) 100 percent

ANSWER: X) LOW

TOSS-UP

7. *BIOLOGY Short Answer* The epiglottis covers the opening of the

ANSWER: LARYNX

BONUS

7. *BIOLOGY Short Answer* What term is used to describe the liquid part of unclotted blood?

ANSWER: PLASMA

TOSS-UP

8. *EARTH SCIENCE Multiple Choice* The theory that Earth's landmasses move is called

- W) continental drift
- X) sea floor spreading
- Y) isostasy
- Z) subduction

ANSWER: W) CONTINENTAL DRIFT

BONUS

8. *EARTH SCIENCE Multiple Choice* Clay minerals are formed through the weathering of which of the following mineral "groups"?

- W) halides
- X) silicates
- Y) oxides
- Z) carbonates

ANSWER: X) SILICATES

TOSS-UP

9. *GENERAL SCIENCE Short Answer* What is the measurement of distance used by ships and airplanes that is equivalent to 1/60 of a degree of longitude at the equator, roughly equivalent to 6,080 feet?

ANSWER: NAUTICAL MILE

BONUS

9. *GENERAL SCIENCE Short Answer* What is the term given to factors such as climate, geology, and atmosphere that affect the biotic environment?

ANSWER: ABIOTIC

TOSS-UP

10. *ASTRONOMY Multiple Choice* What characteristic determines almost everything about the life of a star?

- W) its mass
- X) whether or not it has planets
- Y) its chemical composition
- Z) its color

ANSWER: W) ITS MASS

BONUS

10. *ASTRONOMY Multiple Choice* Binary stars are particularly important for determining stellar

- W) temperature
- X) luminosity
- Y) distance
- Z) mass

ANSWER: Z) MASS

TOSS-UP

11. *EARTH SCIENCE Multiple Choice* Calderas (CALL dare uhs) form

- W) by meteorite impacts
- X) by explosion
- Y) by collapse
- Z) by erosion

ANSWER: Y) BY COLLAPSE

BONUS

11. *EARTH SCIENCE Multiple Choice* Which is not an example of a concordant rock mass?

- W) buried lava flow
- X) sill
- Y) laccolith
- Z) dike

ANSWER: Z) DIKE

TOSS-UP

12. *CHEMISTRY Multiple Choice* Very large molecules made up of repeating units are called

- W) aromatic
- X) chiral
- Y) polymers
- Z) biodegradable

ANSWER: Y) POLYMERS

BONUS

12. *CHEMISTRY Short Answer* Who is credited with discovering the atomic nucleus?

ANSWER: RUTHERFORD

TOSS-UP

13. *BIOLOGY Short Answer* In the heart, what is the name of the “node” which, when it fires, causes the ventricles to contract?

ANSWER: ATRIO-VENTRICULAR NODE (ACCEPT: A-V NODE)

BONUS

13. *BIOLOGY Short Answer* The fastest signals are conducted by neurons covered with what substance?

ANSWER: MYELIN

TOSS-UP

14. *MATH Multiple Choice* In every triangle, the distance from the point of intersection of the medians to any vertex is what proportion of the length of the altitude to that vertex?

- W) $1/3$
- X) $2/3$
- Y) $1/4$
- Z) $3/4$

ANSWER: X) $2/3$

BONUS

14. *MATH Short Answer* The number represented by 1 followed by a hundred zeros is

ANSWER: GOOGOL

TOSS-UP

15. *CHEMISTRY Multiple Choice* The bonding in N_2O_4 is best described as

- W) five s and two p bonds
- X) three s and two p bonds
- Y) seven s bonds
- Z) five s bonds

ANSWER: W) FIVE S AND TWO P BONDS

BONUS

15. *CHEMISTRY Short Answer* What is the correct name for BrO_3^- ?

ANSWER: BROMATE ION

TOSS-UP

16. *ASTRONOMY Multiple Choice* The diameter of the disk of our galaxy is approximately

- W) 3 parsecs
- X) 25,000 parsecs
- Y) 250 parsecs
- Z) 3,000,000 parsecs

ANSWER: X) 25,000 PARSECS

BONUS

16. *ASTRONOMY Multiple Choice* The total time which the Sun will spend as a main sequence star is

- W) at least 200 billion years
- X) about 1 million years
- Y) about 4.5 million years
- Z) about 10 billion years

ANSWER: Z) ABOUT 10 BILLION YEARS

TOSS-UP

17. *BIOLOGY Short Answer* Glycolysis produces a net gain of how many ATP molecules per mole of glucose?

ANSWER: TWO

BONUS

17. *BIOLOGY Multiple Choice* What is the most common shape of a prokaryotic cell?

- W) tuberculus
- X) coccus
- Y) spirillum
- Z) bacillus

ANSWER: Z) BACILLUS

TOSS-UP

18. *GENERAL SCIENCE Short Answer* What is the name for the principle predicted by Einstein's theory of relativity that intervals of time are not absolute, but are relative to the motion of the observers?

ANSWER: TIME DILATION (ACCEPT: TIME DILATATION)

BONUS

18. *GENERAL SCIENCE Short Answer* Which Greek letter symbolizes electrical conductivity, surface tension, or cross section?

ANSWER: SIGMA

TOSS-UP

19. *BIOLOGY Short Answer* What term refers to the location on a chromosome where a gene is located?

ANSWER: LOCUS

BONUS

19. *BIOLOGY Short Answer* What are genes that can move around the genome and sometimes inactivate other genes?

ANSWER: TRANSPOSONS

TOSS-UP

20. *PHYSICS Multiple Choice* The average kinetic energy of individual gas molecules depends only on what property of the gas?

- W) pressure
- X) volume
- Y) temperature
- Z) pressure

ANSWER: Y) TEMPERATURE

BONUS

20. *PHYSICS Short Answer* List the following in order of lowest energy to greatest energy: gamma rays, infrared, radio, ultraviolet.

ANSWER: RADIO, INFRARED, ULTRAVIOLET, GAMMA RAYS

TOSS-UP

21. *MATH Short Answer* What is the value of 125 to the two-thirds power?

ANSWER: 25

BONUS

21. *MATH Short Answer* Two trains are headed directly toward each other at rates of 40 mph and 50 mph. How many miles apart are they 2 minutes before they impact?

ANSWER: 3

TOSS-UP

22. *CHEMISTRY Short Answer* What region of the electromagnetic spectrum is between the microwave and visible regions?

ANSWER: INFRARED REGION

BONUS

22. *CHEMISTRY Multiple Choice* In old fashioned flash bulbs, the light is produced by the reaction of magnesium metal sealed in the bulb with oxygen gas. Thus, after the flash, the mass of the bulb is

- W) greater than it was before use
- X) the same as it was before use
- Y) smaller than it was before use
- Z) unknown

ANSWER: X) THE SAME AS IT WAS BEFORE USE

TOSS-UP

23. *GENERAL SCIENCE Short Answer* What is the name for the scientific study of the near term physical phenomena and processes taking place in the atmosphere and the interactions with the ground surface?

ANSWER: METEOROLOGY

BONUS

23. *GENERAL SCIENCE Short Answer* What is term for a macromolecular material such as rubber that returns rapidly to approximately the initial dimensions and shape after substantial deformation by a weak stress and release of the stress?

ANSWER: ELASTOMER

TOSS-UP

24. *BIOLOGY Short Answer* Plants that contain two or more complete sets of chromosomes are said to be

ANSWER: POLYPLOID

BONUS

24. *BIOLOGY Multiple Choice* The plasma membrane is

- W) completely permeable
- X) selectively permeable
- Y) found only in eukaryotic cells
- Z) found only in prokaryotic cells

ANSWER: X) SELECTIVELY PERMEABLE

TOSS-UP

25. *COMPUTER SCIENCE Short Answer* What is the name for a program that simultaneously translates and executes the instructions of a high-level programming language one by one?

ANSWER: INTERPRETER

BONUS

25. *COMPUTER SCIENCE Multiple Choice* Which of the following HTML tags does not allow you to align an image with the highest or lowest object in the line?

- W) absbottom
- X) absmiddle
- Y) bottom
- Z) top

ANSWER: Y) BOTTOM

REGIONAL ROUND 6B

TOSS-UP

1. *GENERAL SCIENCE Short Answer* What is term for the branch of geology concerned with the study of earthquakes?

ANSWER: SEISMOLOGY

BONUS

1. *GENERAL SCIENCE Short Answer* What is the term for the line on a map or chart joining points or places of equal magnetic dip?

ANSWER: ISOCLINE

TOSS-UP

2. *ASTRONOMY Multiple Choice* The inflationary model helps to explain why the universe appears

- W) small
- X) flat
- Y) closed
- Z) green

ANSWER: X) FLAT

BONUS

2. *ASTRONOMY Multiple Choice* A spectral line of a star is observed at 5002 Angstroms, while the same line is observed in the laboratory at 5000 Angstroms. Which statement is true?

- W) the temperature of the star has decreased
- X) the star is approaching us
- Y) the star is receding from us
- Z) the star's temperature has increased

ANSWER: Y) THE STAR IS RECEDING FROM US

TOSS-UP

3. *CHEMISTRY Short Answer* What is the name for the lowest energy state of an atom?

ANSWER: GROUND

BONUS

3. *CHEMISTRY Short Answer* The energy involved in dissolving a solid is known as the heat of

ANSWER: SOLUTION

TOSS-UP

4. *BIOLOGY Short Answer* Plants fix carbon by what light- requiring process?

ANSWER: PHOTOSYNTHESIS

BONUS

4. *BIOLOGY Multiple Choice* Which biome has broad-leafed plants and black bears?

- W) grassland
- X) taiga
- Y) temperate forest
- Z) tundra

ANSWER: Y) TEMPERATE FOREST

TOSS-UP

5. *ASTRONOMY Multiple Choice* The most massive stars are believed to end up as

- W) black holes
- X) neutron stars
- Y) white dwarfs
- Z) planetary nebulae

ANSWER: W) BLACK HOLES

BONUS

5. *PHYSICS Multiple Choice* Gravity and electro-magnetism are both

- W) long range forces
- X) forces which can be attractive and repulsive
- Y) short range forces
- Z) forces which are always repulsive

ANSWER: W) LONG RANGE FORCES

TOSS-UP

6. *GENERAL SCIENCE Short Answer* What is an instrument called that has cups and a rotating spindle for measuring the speed of the wind?

ANSWER: ANEMOMETER

BONUS

6. *GENERAL SCIENCE Short Answer* What is the name of the yellow or reddish-brown fossil resin that often contains preserved insects or other previously living material?

ANSWER: AMBER

TOSS-UP

7. *COMPUTER SCIENCE Short Answer* RAM chips that require a constant source of electrical energy to maintain their contents are called what?

ANSWER: DRAM OR DYNAMIC RAM

BONUS

7. *COMPUTER SCIENCE Multiple Choice* A site that contains a duplicate copy of a Web presentation from another site is a

- W) Browser
- X) Hypermedia
- Y) Web master
- Z) Mirror site

ANSWER: Z) MIRROR SITE

TOSS-UP

8. *MATH Multiple Choice* The declination angle to a given line is measured in a

- W) clockwise direction from the y-axis
- X) clockwise direction from the x-axis
- Y) counter clockwise direction from the y-axis
- Z) counter clockwise direction from the x-axis

ANSWER: X) CLOCKWISE DIRECTION FROM THE X-AXIS

BONUS

8. *MATH Short Answer* A woman has an equal number of nickels, dimes and quarters. If she has \$12 in total, how many coins does she have?

ANSWER: 90 COINS

TOSS-UP

9. *ASTRONOMY Multiple Choice* Our sun is a

- W) main sequence star
- X) white dwarf
- Y) supergiant
- Z) red giant

ANSWER: W) MAIN SEQUENCE STAR

BONUS

9. *ASTRONOMY Multiple Choice* The speed at which distant galaxies are moving away from us

- W) increases with distance from us
- X) decreases with distance from us
- Y) does not change with distance from us
- Z) is randomly related to distance from us

ANSWER: W) INCREASES WITH DISTANCE FROM US

TOSS-UP

10. *PHYSICS Multiple Choice* A billiard ball collides in an elastic head- on collision with a second identical ball. What is the kinetic energy of the system after the collision compared to that before collision?

- W) the same as
- X) one fourth
- Y) twice
- Z) four times

ANSWER: W) THE SAME AS

BONUS

10. *PHYSICS Multiple Choice* Sea breezes that occur near the shore are attributed to a difference between land and water with respect to what property?

- W) mass density
- X) coefficient of volume expansion
- Y) specific heat
- Z) emissivity

ANSWER: Y) SPECIFIC HEAT

TOSS-UP

11. *COMPUTER SCIENCE Multiple Choice* The part of the central processing unit that performs arithmetic operations and evaluates expressions is the

- W) ALU
- X) ADT
- Y) ISAM
- Z) CERT

ANSWER: W) ALU

BONUS

11. *COMPUTER SCIENCE Short Answer* What is the term used for a program that searches the Web to add sites and documents to a database that can be subsequently accessed with a search engine?

ANSWER: SPIDER

TOSS-UP

12. *GENERAL SCIENCE Short Answer* What is the name for the scientific study of the sea floor and its sediments, the characteristics of ocean waters, and the types of flora and fauna within the oceans?

ANSWER: OCEANOGRAPHY

BONUS

12. *GENERAL SCIENCE Short Answer* What is the term for a device used to detect and measure the intensity of radiant energy which consists of a number of thermocouples connected together?

ANSWER: THERMOPILE

TOSS-UP

13. *ASTRONOMY Short Answer* Stars are spherical because of what phenomena?

ANSWER: GRAVITY

BONUS

13. *ASTRONOMY Multiple Choice* Venus is closest to which object in size and mass?

W) Mercury

X) Mars

Y) Earth

Z) Earth's Moon

ANSWER: Y) EARTH

TOSS-UP

14. *GENERAL SCIENCE Short Answer* What is the term for the number that provides a measure of the ability of a fuel to resist knocking when it is burnt in a spark-ignition engine?

ANSWER: OCTANE NUMBER

BONUS

14. *GENERAL SCIENCE Short Answer* What is the name for the device that provides the required starting voltage and operating current for fluorescent, mercury, and other electric discharge lamps?

ANSWER: BALLAST

TOSS-UP

15. *EARTH SCIENCE Short Answer* What broad area of air has about the same temperature and humidity throughout?

ANSWER: AIR MASS

BONUS

15. *EARTH SCIENCE Multiple Choice* All of the following are types of shoreline currents EXCEPT

- W) undertow
- X) Gulf Stream
- Y) rip current
- Z) long shore current

ANSWER: X) GULF STREAM

TOSS-UP

16. *MATH Short Answer* The independent variable in the equation $y = f(x)$ (read as y equals f of x) is

ANSWER: X

BONUS

16. *MATH Short Answer* What is the sum of the interior angles in a hexagon?

ANSWER: 720 DEGREES

TOSS-UP

17. *ASTRONOMY Multiple Choice* Where are elements heavier than iron formed?

- W) supernova explosions
- X) stars like the Sun
- Y) white dwarfs
- Z) protostars

ANSWER: W) SUPERNOVA EXPLOSIONS

BONUS

17. *ASTRONOMY Multiple Choice* Which of the following is not true for gaseous giant planets?

- W) they are the largest planets
- X) they have low densities
- Y) they are far from the Sun
- Z) they are very hot at the cloud surface

ANSWER: Z) THEY ARE VERY HOT AT THE CLOUD SURFACE

TOSS-UP

18. *GENERAL SCIENCE Short Answer* What is the common name for a device for transferring heat from a low temperature source to a high temperature region through the use of a vapor compression/expansion cycle?

ANSWER: HEAT PUMP

BONUS

18. *GENERAL SCIENCE Short Answer* What is the term for the scientific study of X-rays, radioactive materials, and other ionizing radiations for medical purposes?

ANSWER: RADIOLOGY

TOSS-UP

19. *ASTRONOMY Multiple Choice* A star's surface temperature is related to its

- W) spectral class
- X) parallax
- Y) distance
- Z) composition

ANSWER: W) SPECTRAL CLASS

BONUS

19. *ASTRONOMY Multiple Choice* Kepler determined that planets follow what types of paths around the Sun

- W) perfect circles
- X) ellipses
- Y) hyperbolas
- Z) intersecting

ANSWER: X) ELLIPSES

TOSS-UP

20. *EARTH SCIENCE Short Answer* What is the sharp boundary between two air masses called?

ANSWER: FRONT

BONUS

20. *EARTH SCIENCE Short Answer* What is the term for the place where water flows out of a stream or river and into another body of water?

ANSWER: MOUTH

TOSS-UP

21. *BIOLOGY Short Answer* In the cell, the process of transcription is followed by what process in order the manufacture a protein?

ANSWER: TRANSLATION

BONUS

21. *BIOLOGY Multiple Choice* “Dense” and “loose” are different kinds of

- W) epithelial cells
- X) muscle tissue
- Y) nerve tissue
- Z) connective tissue

ANSWER: Z) CONNECTIVE TISSUE

TOSS-UP

22. *CHEMISTRY Short Answer* How many calories does it take to warm 10 g of pure water from 90 degrees C to 100 degrees C?

ANSWER: ONE HUNDRED CALORIES

BONUS

22. *CHEMISTRY Multiple Choice* Which of the following compounds is covalent?

- W) CaCl_2
- X) MgO
- Y) PCl_3
- Z) Cs_2S

ANSWER: Y) PCl_3

TOSS-UP

23. *GENERAL SCIENCE Short Answer* A material or solution that has a pH greater than 7 is said to be:

ANSWER: ALKALINE (ALSO ACCEPT BASIC)

BONUS

23. *GENERAL SCIENCE Short Answer* What is the name for the scientific study of terrestrial or inland water before its discharge into the ocean or evaporation into the atmosphere and which has important applications such as flood control, irrigation, and hydroelectric power?

ANSWER: HYDROLOGY

TOSS-UP

24. *MATH Short Answer* In a two-dimensional system of Cartesian coordinates, the horizontal or x-coordinate of a point is called the

ANSWER: ABSCISSA

BONUS

24. *MATH Short Answer* What is the value of x at which the minimum of the function f of $x = x^2 - \frac{1}{2}$ occurs

ANSWER: 0

TOSS-UP

25. *GENERAL SCIENCE Short Answer* What is the name for the process where a lake can be negatively effected by the presence of fertilizers, leading to excessive growth of algae and subsequent depletion of oxygen content?

ANSWER: EUTROPHICATION

BONUS

25. *GENERAL SCIENCE Short Answer* What is the name for the hormone made by the human body that speeds the heart and dilates the blood vessels?

ANSWER: ADRENALINE (ACCEPT: EPINEPHRINE)

REGIONAL ROUND 7B

TOSS-UP

1. *EARTH SCIENCE Short Answer* What name is given to a crack in the rocks of the Earth's crust along which some movement has occurred?

ANSWER: FAULT

BONUS

1. *EARTH SCIENCE Multiple Choice* How are extrusive and intrusive rocks similar?

- W) both are sedimentary rocks
- X) both have coarse-grained texture
- Y) both are formed from magma
- Z) both are spewed forth from a volcano

ANSWER: Y) BOTH ARE FORMED FROM MAGMA

TOSS-UP

2. *CHEMISTRY Short Answer* When the hydroxide ion concentration equals 1×10^{-5} mol/L, what is the pH of the solution?

ANSWER: NINE

BONUS

2. *CHEMISTRY Short Answer* What is the pressure (in kilopascals) when a liquid is boiling at its normal boiling point?

ANSWER: 101 KILOPASCALS

TOSS-UP

3. *MATH Multiple Choice* Let f of $x = x + 3$ and let g of $x = 2x$. Find the value of the composite function $f \circ g$ of x when $x = 1$

- W) -5
- X) 5
- Y) 3
- Z) -3

ANSWER: X) 5

BONUS

3. *MATH Short Answer* Suppose $f(x) = (x^4 + x + 7)^{100}$, (read as: F of X equals the quantity X to the fourth plus X plus 7 end quantity to the 100th power) what is df/dx ? (read as: D F D X)

ANSWER: $100(x^4 + x + 7)^{99}(4x^3 + 1)$ (READ AS: ONE HUNDRED TIMES THE QUANTITY X TO THE FOURTH PLUS X PLUS SEVEN END QUANTITY TO THE NINETY-NINTH POWER TIMES QUANTITY FOUR X TO THE THIRD POWER PLUS ONE END QUANTITY)

TOSS-UP

4. *PHYSICS Multiple Choice* The unit for rate of energy transformation, the Watt, in an electric circuit is dimensionally equivalent to which of the following?

- W) Volt per sec
- X) Ampere Ohm
- Y) Volt Ampere
- Z) Volt per Ohm

ANSWER: Y) VOLT AMPERE

BONUS

4. *PHYSICS Multiple Choice* In a graph of displacement versus time, the slope of the line at any point

- W) is the displacement
- X) is the velocity
- Y) is the acceleration
- Z) has no physical significance

ANSWER: X) IS THE VELOCITY

TOSS-UP

5. *MATH Short Answer* A line segment connecting two points on a curve or surface is a

ANSWER: CHORD

BONUS

5. *MATH Short Answer* The following formula $\int u \, d.v. = UV - \int v \, du$ (read as: the indefinite integral $u \, d.v.$ equals uv minus the integral $v \, du$) is known as

ANSWER: INTEGRATION BY PARTS

TOSS-UP

6. *ASTRONOMY Short Answer* What gas is converted to helium and energy during the fusion process occurring within the Sun?

ANSWER: HYDROGEN

BONUS

6. *ASTRONOMY Multiple Choice* The volcanoes on Mars are

- W) stratovolcanoes
- X) shield volcanoes
- Y) cinder cones
- Z) flood basalts

ANSWER: X) SHIELD VOLCANOES

TOSS-UP

7. *PHYSICS Short Answer* What principle states that if the atmospheric pressure increases, the pressure in the fluid increases?

ANSWER: PASCAL'S PRINCIPLE

BONUS

7. *PHYSICS Multiple Choice* An object of mass M is lifted a vertical distance Y and then carried a horizontal distance X. The total work done is

W) $M(Y+X)$

X) MX

Y) MY

Z) $M(Y-X)$

ANSWER: Y) MY

TOSS-UP

8. *EARTH SCIENCE Short Answer* What is a naturally occurring inorganic solid substance with a definite chemical composition called?

ANSWER: MINERAL

BONUS

8. *EARTH SCIENCE Short Answer* Which geologist first proposed the principle of uniformitarianism?

ANSWER: JAMES HUTTON

TOSS-UP

9. *BIOLOGY Multiple Choice* The notochord is most closely associated with the

- W) nervous system
- X) spinal cord
- Y) skeletal system
- Z) skin system

ANSWER: Y) SKELETAL SYSTEM

BONUS

9. *BIOLOGY Short Answer* What term describes the likelihood that an individual with a dominant allele will show the phenotype usually associated with that genotype?

ANSWER: PENETRANCE

TOSS-UP

10. *PHYSICS Multiple Choice* When an object is dropped from a tower, what is the effect of the air resistance as it falls?

- W) does positive work
- X) increases the object's kinetic energy
- Y) increases the object's potential energy
- Z) None of the above choices are valid

ANSWER: Z) NONE OF THE ABOVE CHOICES ARE VALID

BONUS

10. *PHYSICS Multiple Choice* When the Kelvin temperature of a gas is quadrupled, what will happen to the v_{rms} ?

- W) it is halved
- X) it is doubled
- Y) it is quadrupled
- Z) it is unchanged

ANSWER: X) IT IS DOUBLED

TOSS-UP

11. *EARTH SCIENCE Multiple Choice* Which mineral is abundant in the continental crust but rare in the oceanic crust and mantle?

- W) Plagioclase
- X) Pyroxene
- Y) Quartz
- Z) Olivine

ANSWER: Y) QUARTZ

BONUS

11. *EARTH SCIENCE Multiple Choice* Which mineral accumulates the most in sand from weathering of granite?

- W) olivine
- X) pyroxene
- Y) amphibole
- Z) quartz

ANSWER: Z) QUARTZ

TOSS-UP

12. *ASTRONOMY Multiple Choice* The length of a day on Mars is

- W) 16 hours 27 minutes
- X) 24 hours 37 minutes
- Y) 31 hours 13 minutes
- Z) 37 hours 19 minutes

ANSWER: X) 24 HOURS 37 MINUTES

BONUS

12. *ASTRONOMY Multiple Choice* How many moons does Saturn have?

- W) 5
- X) 10
- Y) 18
- Z) 28

ANSWER: Y) 18

TOSS-UP

13. *CHEMISTRY Short Answer* How many different isomers are possible for a hydrocarbon with the molecular formula C_3H_8 ?

ANSWER: ONE

BONUS

13. *CHEMISTRY Short Answer* How many electrons are in the outermost shell of strontium (atomic number 38)?

ANSWER: TWO

TOSS-UP

14. *COMPUTER SCIENCE Short Answer* What is the file extension used that identifies encoded data streams that contain compressed audio and video information, using the format specified by the Moving Pictures Experts Group?

ANSWER: .MPG

BONUS

14. *COMPUTER SCIENCE Short Answer* What is the term for devices that connect networks of the same or different types and have the savvy to direct data across these networks for improved performance and efficiency?

ANSWER: ROUTERS

TOSS-UP

15. *ASTRONOMY Multiple Choice* The image in the radio part of the spectrum of radio galaxies looks like

- W) a spiral
- X) an ellipse
- Y) two lobes (a figure eight)
- Z) a disk

ANSWER: Y) TWO LOBES (A FIGURE EIGHT)

BONUS

15. *ASTRONOMY Multiple Choice* An "ephemeris" is

- W) an upright stick that casts a shadow
- X) a book of planetary positions
- Y) a map of the visible stars
- Z) a model of the Solar System

ANSWER: X) A BOOK OF PLANETARY POSITIONS

TOSS-UP

16. *CHEMISTRY Multiple Choice* Atoms are held together in compounds by

- W) chemical bonds
- X) electronegativity
- Y) lattice energy
- Z) free radicals

ANSWER: W) CHEMICAL BONDS

BONUS

16. *CHEMISTRY Multiple Choice* What types of hydrocarbons are more abundant in higher octane gasoline?

- W) highly branched hydrocarbons
- X) smaller and less massive hydrocarbons
- Y) larger and more massive hydrocarbons
- Z) hydrocarbons containing eight carbon atoms

ANSWER: W) HIGHLY BRANCHED HYDROCARBONS

TOSS-UP

17. *MATH Multiple Choice* "Strata" are groups of population units that

- W) form well defined subpopulations
- X) are selected for the study
- Y) form independent simple random samples
- Z) are relatively heterogeneous in nature

ANSWER: W) FORM WELL DEFINED SUBPOPULATIONS

BONUS

17. *MATH Multiple Choice* Using natural logarithms, the natural log of x plus the natural log of y equals,

- W) natural log of (x + y)
- X) natural log of (xy)
- Y) natural log of (x - y)
- Z) none of the above

ANSWER: X) NATURAL LOG OF (XY)

TOSS-UP

18. *COMPUTER SCIENCE Short Answer* What is the term used to describe a provisional version of a software product that is released to the public for testing through normal use and to report problems back to the programmers?

ANSWER: BETA VERSION

BONUS

18. *COMPUTER SCIENCE Short Answer* What is the acronym that describes the computer-aided design file format originally developed for use with the AutoCAD program to facilitate transfer of graphic files between applications?

ANSWER: DXF (ACCEPT: DRAWING INTERCHANGE FORMAT)

TOSS-UP

19. *ASTRONOMY Multiple Choice* Estimates of the age of the universe are generally in the range of

- W) 1 - 2 million years
- X) 1 - 2 billion years
- Y) 10 - 20 billion years
- Z) 100-200 billion years

ANSWER: Y) 10 - 20 BILLION YEARS

BONUS

19. *ASTRONOMY Multiple Choice* The planet Venus is often visible from central latitudes in the western evening sky or eastern morning sky, and does not appear to twinkle. The stars, however, do appear to twinkle. The reason or reasons that Venus does not twinkle is

- W) it shows a visible disk larger than an arc-second
- X) the angular range of light from Venus is larger than that of random atmospheric deflection
- Y) it is fairly close to us relative to the distance to the nearest stars
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

TOSS-UP

20. *MATH Short Answer* What is the value of the natural logarithm of the quantity e^3 ?

ANSWER: 3

BONUS

20. *MATH Multiple Choice* The two major branches of statistics are

- W) populations and samples
- X) simple random and stratified random sampling
- Y) descriptive and inferential statistics
- Z) observational and experimental data

ANSWER: Y) DESCRIPTIVE AND INFERENTIAL STATISTICS

TOSS-UP

21. *BIOLOGY Short Answer* What enzyme joins two segments of DNA to make a single molecule?

ANSWER: DNA LIGASE

BONUS

21. *BIOLOGY Multiple Choice* Carbonic anhydrase is an enzyme found in

- W) brain cells
- X) erythrocytes
- Y) the liver
- Z) platelets

ANSWER: X) ERYTHROCYTES

TOSS-UP

22. *CHEMISTRY Short Answer* How many electrons are in the highest occupied energy level of copper?

ANSWER: ONE

BONUS

22. *CHEMISTRY Short Answer* Name the organometallic reagent in which magnesium metal inserts between an alkyl group and a halogen?

ANSWER: GRIGNARD (PRON: GRIN – YARD)

TOSS-UP

23. *PHYSICS Short Answer* An answering machine requires 12 volts of alternating current to function. Its power supply uses a transformer having a primary winding of 1800 turns to step down your house's 120 volt alternating current. How many turns are there on the secondary winding

ANSWER: 180 TURNS

BONUS

23. *PHYSICS Multiple Choice* How much work is done by a heat engine when it absorbs heat Q from a hot reservoir?

- W) Q
- X) must be less than Q
- Y) could be greater than Q
- Z) zero

ANSWER: X) MUST BE LESS THAN Q

TOSS-UP

24. *COMPUTER SCIENCE Short Answer* What is the name of the disk drive developed by Iomega that uses 3.5-inch removable disks capable of storing 100MB of data?

ANSWER: ZIP DRIVE

BONUS

24. *COMPUTER SCIENCE Multiple Choice* When describing font size, how many "points" are there per inch?

- W) 68
- X) 32
- Y) 72
- Z) 70

ANSWER: Y) 72

TOSS-UP

25. *ASTRONOMY Short Answer* What is the dark central portion of a shadow called?

ANSWER: UMBRA

BONUS

25. *ASTRONOMY Multiple Choice* The rate of cratering on the lunar highlands helps to show that:

- W) they are younger than the maria
- X) they are older than the maria
- Y) they are about 1 billion years old
- Z) they are about 2 billion years old

ANSWER: X) THEY ARE OLDER THAN THE MARIA

REGIONAL ROUND 8B

TOSS-UP

1. *CHEMISTRY Short Answer* What law states that the total pressure in a mixture of unreacting gases is equal to the sum of the partial pressures of the individual gases?

ANSWER: DALTON'S LAW

BONUS

1. *CHEMISTRY Multiple Choice* What physical property of hydrocarbons is used for fractional distillation?

- W) the molecular mass
- X) the molecular size
- Y) the viscosity
- Z) the boiling temperature

ANSWER: Z) THE BOILING TEMPERATURE

TOSS-UP

2. *ASTRONOMY Multiple Choice* The main problem with the Copernican model was

- W) it assumed the Sun was at the center of the solar system
- X) it assumed the Earth was at the center of the solar system
- Y) it was based on perfect circular motions
- Z) it was too complicated for anyone to understand

ANSWER: Y) IT WAS BASED ON PERFECT CIRCULAR MOTIONS

BONUS

2. *ASTRONOMY Multiple Choice* How many astronomical units are there between the Earth and Sun?

- W) one
- X) ten
- Y) one million
- Z) six trillion

ANSWER: W) ONE

TOSS-UP

3. *COMPUTER SCIENCE Short Answer* What is the term used to describe a logical expression that evaluates to either true or false?

ANSWER: BOOLEAN EXPRESSION

BONUS

3. *COMPUTER SCIENCE Short Answer* What is the software layer that is responsible for bringing pages from disk to main memory as needed?

ANSWER: BUFFER MANAGER

TOSS-UP

4. *EARTH SCIENCE Multiple Choice* Fossil corals found in Canada and marks left by glaciers in rocks of the Sahara are two clues to past changes in the

- W) kinds of living things
- X) climate
- Y) air
- Z) water

ANSWER: X) CLIMATE

BONUS

4. *EARTH SCIENCE Multiple Choice* Which of the following minerals is not likely to be associated with an evaporite deposit?

- W) gypsum
- X) halite
- Y) dolomite
- Z) bauxite

ANSWER: Z) BAUXITE

TOSS-UP

5. *GENERAL SCIENCE Short Answer* What is the term for a glowing electrical discharge from a metal object which has been subjected to a strong buildup of static electricity?

ANSWER: CORONA (ACCEPT: ST. ELMO'S FIRE)

BONUS

5. *GENERAL SCIENCE Short Answer* What is the name for the movement of nutrient rich bottom water to the ocean's surface?

ANSWER: UPWELLING

TOSS-UP

6. *BIOLOGY Multiple Choice* If an organism's enzymes are heated to a point where they lose their activity, they are said to be

- W) unstable
- X) denatured
- Y) motionless
- Z) all of the above

ANSWER: X) DENATURED

BONUS

6. *BIOLOGY Multiple Choice* Which of the following is NOT true of enzyme behavior?

- W) Each enzyme can catalyze a wide variety of different reactions
- X) The active site of an enzyme orients its substrate molecules, thereby promoting interaction of their reactive parts
- Y) All enzymes have an active site where substrates are temporarily bound
- Z) Enzyme shape may change during catalysis

ANSWER: W) EACH ENZYME CAN CATALYZE A WIDE VARIETY OF DIFFERENT REACTIONS

TOSS-UP

7. *CHEMISTRY Multiple Choice* A characteristic of ligands is that

- W) they are Lewis acids
- X) they are Lewis bases
- Y) they are ions
- Z) they are electron pair acceptors

ANSWER: X) THEY ARE LEWIS BASES

BONUS

7. *CHEMISTRY Multiple Choice* The compound expected when chlorine reacts with aluminum is

- W) Al_2Cl_3
- X) Al_3Cl_2
- Y) AlCl_3
- Z) Al_3Cl

ANSWER: Y) AlCl_3

TOSS-UP

8. *MATH Short Answer* Evaluate $\sin(p/4) + \cos(3p/4)$.

ANSWER: 0

BONUS

8. *MATH Short Answer* Solve the equation $|2x-1|=3$ (read: absolute value of the quantity 2x minus 1 equals 3)

ANSWER: $X=-1$ or $X=2$ (both answers are required)

TOSS-UP

9. *EARTH SCIENCE Multiple Choice* When water comes in contact with the mineral feldspar

- W) granite forms
- X) clay minerals form
- Y) carbon dioxide forms
- Z) rust forms

ANSWER: X) CLAY MINERALS FORM

BONUS

9. *EARTH SCIENCE Multiple Choice* Dinosaur tracks are examples of

- W) recrystallized fossils
- X) internal molds
- Y) trace fossils
- Z) replacement fossils

ANSWER: Y) TRACE FOSSILS

TOSS-UP

10. *COMPUTER SCIENCE Multiple Choice* Who was the inventor of the mouse?

- W) John Mauchly
- X) J.J. Fourier
- Y) Douglas Engelbart
- Z) J. Presper Eckert

ANSWER: Y) DOUGLAS ENGELBART

BONUS

10. *COMPUTER SCIENCE Multiple Choice* By typing this word at the operating system prompt, your default home page or main screen will appear.

- W) link
- X) lynx
- Y) bookmark
- Z) goto

ANSWER: X) LYNX

TOSS-UP

11. *ASTRONOMY Multiple Choice* What was one of the contributions made by Copernicus to astronomy?

- W) he discovered that the planets move around the Sun in Elliptical orbits
- X) he said that the Earth is not the center of the universe
- Y) he used a telescope to observe the heavens, thereby reinforcing the notion of heliocentricity
- Z) he made extensive and detailed observations of the positions of the planets

ANSWER: X) HE SAID THAT THE EARTH IS NOT THE CENTER OF THE UNIVERSE

BONUS

11. *ASTRONOMY Multiple Choice* The presence of a magnetic field is a good indication that

- W) a large amount of magnetic material, probably brought to Earth during a meteorite fall, is buried somewhere near the North Pole
- X) a quantity of liquid metal is swirling around in the Earth's core
- Y) the Earth is composed mostly of iron
- Z) the Earth is completely solid

ANSWER: X) A QUANTITY OF LIQUID METAL IS SWIRLING AROUND IN THE EARTH'S CORE

TOSS-UP

12. *BIOLOGY Short Answer* How many ATP molecules (net yield) are produced per molecule of glucose metabolized during glycolysis?

ANSWER: 2

BONUS

12. *BIOLOGY Short Answer* A neuron repolarizes by the outflux of what ions?

ANSWER: POTASSIUM

TOSS-UP

13. *EARTH SCIENCE Multiple Choice* "Lobe-finned" fish were important links between

- W) alligators and crocodiles
- X) snakes and snails
- Y) dinosaurs and birds
- Z) fish and amphibians

ANSWER: Z) FISH AND AMPHIBIANS

BONUS

13. *EARTH SCIENCE Multiple Choice* U-shaped valleys were shaped by the passage of

- W) glaciers
- X) running water
- Y) wind
- Z) all of the above

ANSWER: W) GLACIERS

TOSS-UP

14. *BIOLOGY Multiple Choice* The group of plants that has the most species is the

- W) mosses
- X) ferns
- Y) gymnosperms
- Z) dicots

ANSWER: Z) DICOTS

BONUS

14. *BIOLOGY Multiple Choice* The secretion of aldosterone stimulates the reabsorption of

- W) calcium
- X) sodium
- Y) potassium
- Z) iron

ANSWER: X) SODIUM

TOSS-UP

15. *PHYSICS Multiple Choice* A billiard ball collides in an elastic head- on collision with a second stationary identical ball. After the collision which of the following conditions applies to the first ball?

- W) maintains the same velocity as before
- X) has one half its initial velocity
- Y) comes to rest
- Z) moves in the opposite direction

ANSWER: Y) COMES TO REST

BONUS

15. *PHYSICS Short Answer* If the speed of an object triples, the work required to stop the car changes by a factor of what number?

ANSWER: NINE

TOSS-UP

16. *EARTH SCIENCE Multiple Choice* Erosion caused by the sandblasting effect of windblown sediments is called

- W) deflation
- X) abrasion
- Y) loess
- Z) outwash

ANSWER: X) ABRASION

BONUS

16. *EARTH SCIENCE Multiple Choice* The Cambrian fossil record includes large numbers of shelled

- W) trilobites
- X) vertebrates
- Y) reptiles
- Z) stromatolites

ANSWER: W) TRILOBITES

TOSS-UP

17. *MATH Multiple Choice* If a polynomial of degree m and a polynomial of degree n were multiplied together, and the resulting polynomial were set equal to zero, what is the maximum number of solutions this equation could have?

- W) $m + n$
- X) $m - n$
- Y) m times n
- Z) not enough information given

ANSWER: W) $M + N$

BONUS

17. *MATH Multiple Choice* For the graph of the function $f(x) = 1/x$, what does the line at $x = 0$ represent?

- W) circle
- X) hyperbola
- Y) vertical asymptote
- Z) horizontal asymptote

ANSWER: Y) VERTICAL ASYMPTOTE

TOSS-UP

18. *CHEMISTRY Multiple Choice* Compare the mass of the nucleus of an atom to the sum of the masses of the nucleons that compose the nucleus

- W) less than
- X) equal to
- Y) more than
- Z) the square of

ANSWER: W) LESS THAN

BONUS

18. *CHEMISTRY Multiple Choice* If an element of atomic number 118 is ever synthesized, it would be

- W) chemically inert
- X) a gas at room temperature
- Y) radioactive
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

TOSS-UP

19. *EARTH SCIENCE Multiple Choice* From where does the organic matter added to soil in nature come?

- W) fertilizer
- X) minerals
- Y) coal, oil, and natural gas
- Z) the remains of plants and animals

ANSWER: Z) THE REMAINS OF PLANTS AND ANIMALS

BONUS

19. *EARTH SCIENCE Multiple Choice* Which of the following is the coldest layer of the atmosphere?

- W) troposphere
- X) mesosphere
- Y) stratosphere
- Z) thermosphere

ANSWER: X) MESOSPHERE

TOSS-UP

20. *PHYSICS Multiple Choice* Bernoulli's equation is a statement of conservation of

- W) energy for fluids of constant density
- X) momentum for fluids of constant density
- Y) mass for fluids of constant density
- Z) pressure for fluids of constant density

ANSWER: W) ENERGY FOR FLUIDS OF CONSTANT DENSITY

BONUS

20. *PHYSICS Short Answer* What is the power consumption (in amperes) of an electric iron if resistance is 5 ohms and it operates on a household circuit with a voltage of 120 Volts?

ANSWER: 24 AMPS

TOSS-UP

21. *GENERAL SCIENCE Short Answer* What is the term for a balloon mounted package with sensors and a radio that are released into the atmosphere to measure temperature, humidity, and wind?

ANSWER: RADIOSONDES

BONUS

21. *GENERAL SCIENCE Short Answer* What is the name for an apparatus used to measure the rate of water loss from a plant under natural or artificial conditions?

ANSWER: POTOMETER

TOSS-UP

22. *CHEMISTRY Short Answer* What is the general term used to describe a radioisotope that signals the presence of the species of interest?

ANSWER: TRACER

BONUS

22. *CHEMISTRY Multiple Choice* Which of the following changes will decrease the rate of collisions between gaseous molecules of type A and B in a closed container?

- W) Decrease the volume of the container
- X) Increase the temperature of the system
- Y) Add A molecules
- Z) Take away B molecules

ANSWER: Z) TAKE AWAY B MOLECULES

TOSS-UP

23. *BIOLOGY Short Answer* What does oxygen released in photosynthesis come from?

ANSWER: WATER

BONUS

23. *BIOLOGY Short Answer* The process of aerobic respiration involves electron transport and phosphorylation in which cytoplasmic organelle?

ANSWER: MITOCHONDRION

TOSS-UP

24. *COMPUTER SCIENCE Short Answer* What is the term used to describe the portion of an expert system that implements a reasoning strategy for manipulating the knowledge base?

ANSWER: INFERENCE ENGINE

BONUS

24. *COMPUTER SCIENCE Multiple Choice* What acronym describes a serial interface standard that allows for the connection of music synthesizers, musical instruments and computers?

- W) MIME
- X) MIDI
- Y) MILCON
- Z) MMX

ANSWER: X) MIDI (ACCEPT: MUSICAL INSTRUMENT DIGITAL INTERFACE)

TOSS-UP

25. *CHEMISTRY Short Answer* Which physical state of nitrogen has the highest entropy?

ANSWER: GAS

BONUS

25. *CHEMISTRY Multiple Choice* Which of the following elements is not extracted from sea water or sea water residues?

- W) potassium
- X) bromine
- Y) iodine
- Z) magnesium

ANSWER: Y) IODINE

REGIONAL ROUND 9B

TOSS-UP

1. *BIOLOGY Multiple Choice* In comparing two solutions, the solution with the higher solute concentration is termed what with respect to the other?

- W) osmotic
- X) isotonic
- Y) hypotonic
- Z) hypertonic

ANSWER: Z) HYPERTONIC

BONUS

1. *BIOLOGY Multiple Choice* The plasma of the blood is about what percent water?

- W) 0
- X) 50
- Y) 70
- Z) 90

ANSWER: Z) 90

TOSS-UP

2. *GENERAL SCIENCE Short Answer* What are the units of candlepower, or the luminous intensity of a light source?

ANSWER: CANDELAS

BONUS

2. *GENERAL SCIENCE Short Answer* What is the term used to describe the reflectivity of the earth's surface to incoming solar radiation?

ANSWER: ALBEDO

TOSS-UP

3. *PHYSICS Multiple Choice* Which of the following measurements of length is shortest?

- W) nanometer
- X) angstrom
- Y) fermi
- Z) micron

ANSWER: Y) FERMI

BONUS

3. *PHYSICS Multiple Choice* The dimensional equivalence of the quantity "momentum" in terms of the fundamental quantities (mass, length, time) is

- W) MLT^{-1}
- X) ML^2T^{-2}
- Y) MLT
- Z) MLT^{-2}

ANSWER: W) MLT^{-1}

TOSS-UP

4. *BIOLOGY Short Answer* This compound is the most likely end product of a human runner experiencing an oxygen debt in his or her muscles

ANSWER: LACTATE (ACCEPT: LACTIC ACID)

BONUS

4. *BIOLOGY Multiple Choice* Within the chloroplast, which of the following is NOT associated with the light-dependent reactions of photosynthesis

- W) ATP
- X) thylakoids
- Y) chlorophyll
- Z) stroma

ANSWER: Z) STROMA

TOSS-UP

5. *EARTH SCIENCE Multiple Choice* Sedimentary layering interrupted by erosion indicates

- W) a correlation
- X) a key bed
- Y) a trace fossil
- Z) an unconformity

ANSWER: Z) AN UNCONFORMITY

BONUS

5. *EARTH SCIENCE Multiple Choice* Bedded deposits of windblown silt are called

- W) lahars ("luh-harrs")
- X) loess ("luss")
- Y) bentonite
- Z) playas ("ply-uhs")

ANSWER: X) LOESS

TOSS-UP

6. *GENERAL SCIENCE Short Answer* What is the term for the permanent and continuing dimensional deformation of a material under a sustained load?

ANSWER: CREEP

BONUS

6. *GENERAL SCIENCE Short Answer* What is the typical spacing between wood studs in light weight wall construction?

ANSWER: SIXTEEN INCHES (ON CENTER)

TOSS-UP

7. *ASTRONOMY Multiple Choice* City lights can cause a background glow in the sky called by astronomers

- W) the dawn effect
- X) light pollution
- Y) refracted light
- Z) none of the above

ANSWER: X) LIGHT POLLUTION

BONUS

7. *ASTRONOMY Multiple Choice* In order to settle the question of the nature of spiral "nebulae," Hubble observed

- W) a supernova in a nearby spiral
- X) white dwarfs in the Magellanic Clouds
- Y) Cepheid (pron: se'-fid) variables in Andromeda
- Z) the recessional velocities of galaxies

ANSWER: Y) CEPHEID VARIABLES IN ANDROMEDA

TOSS-UP

8. *PHYSICS Multiple Choice* Which formula is dimensionally consistent with an expression yielding a value for velocity when a is acceleration, x is distance, and t is time?

- W) v/t^2
- X) vx^2
- Y) v^2/t
- Z) at

ANSWER: Z) at

BONUS

8. *PHYSICS Short Answer* In a 2-dimensional Cartesian coordinate system, the x-component of a given vector is equal to that vector's magnitude multiplied by which trigonometric function, with respect to the angle between vector and x-axis?

ANSWER: COSINE

TOSS-UP

9. *CHEMISTRY Multiple Choice* The boiling temperature of water is so much higher than that of methane because water molecules are

- W) more massive
- X) polar
- Y) composed of fewer atoms
- Z) smaller

ANSWER: X) POLAR

BONUS

9. *CHEMISTRY Short Answer* The addition of atoms to the same side of a molecule is known as

ANSWER: SYN ADDITION

TOSS-UP

10. *BIOLOGY Short Answer* What is the largest artery in the body?

ANSWER: AORTA

BONUS

10. *BIOLOGY Multiple Choice* In ecology, examples of "producers" are

- W) algae and plants
- X) algae and viruses
- Y) bacteria and viruses
- Z) fungi and plants

ANSWER: W) ALGAE AND PLANTS

TOSS-UP

11. *GENERAL SCIENCE Short Answer* What fine, inorganic, non-combustible material has been historically used as an insulation material but has been recently found to be a hazardous material?

ANSWER: ASBESTOS

BONUS

11. *GENERAL SCIENCE Multiple Choice* Overuse of groundwater can lead to

- W) saltwater intrusion
- X) subsidence
- Y) aquifer depletion
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

TOSS-UP

12. *MATH Short Answer* How many faces are on a dodecahedron?

ANSWER: 12

BONUS

12. *MATH Multiple Choice* Find the largest value in the range of the function $f(x) = 7 - 2x$, if -1 is less than or equal to x is less than or equal to 6

- W) 7
- X) 1
- Y) 9
- Z) 6

ANSWER: Y) 9

TOSS-UP

13. *ASTRONOMY Multiple Choice* A pulsar is most probably formed

- W) in the center of a supernova explosion
- X) in the core of a star as it evolves through its main sequence phase
- Y) just after the formation of a protostar by gravitational condensation
- Z) within a huge gas cloud, by collisions between stars

ANSWER: W) IN THE CENTER OF A SUPERNOVA EXPLOSION

BONUS

13. *ASTRONOMY Short Answer* The location of the main sequence turn-off point on an H-R diagram is an indication of the cluster's what?

ANSWER: AGE

TOSS-UP

14. *BIOLOGY Short Answer* Glucose is released into the bloodstream from what organ?

ANSWER: LIVER

BONUS

14. *BIOLOGY Short Answer* What chemical released by helper T cells activate T and B cells, thus stimulating cell division?

ANSWER: INTERLEUKIN 2

TOSS-UP

15. *COMPUTER SCIENCE Multiple Choice* Who was the German mathematician who designed the first arithmetic calculating device capable of performing multiplication and division. This individual also was the first to explore the properties of binary numbering.

- W) Ada Lovelace
- X) John vonNeumann
- Y) G. W. von Leibniz
- Z) None of the above

ANSWER: Y) G. W. VON LEIBNIZ

BONUS

15. *COMPUTER SCIENCE Short Answer* What is the protocol for servers on the Internet that receive, store, and transmit e-mail and for clients on computers that connect to the servers that download and upload e-mail called?

ANSWER: POP OR POST OFFICE PROTOCOL

TOSS-UP

16. *GENERAL SCIENCE Short Answer* What is the term for the current-carrying capacity of a wire or cable?

ANSWER: AMPACITY

BONUS

16. *GENERAL SCIENCE Short Answer* What is the science of sound, including the generation, transmission, and effects of sound waves?

ANSWER: ACOUSTICS

TOSS-UP

17. *ASTRONOMY Multiple Choice* Which of the following objects has the greatest luminosity?

- W) Sun
- X) hot O-type star
- Y) white dwarf
- Z) diffuse cloud

ANSWER: X) HOT O-TYPE STAR

BONUS

17. *ASTRONOMY Multiple Choice* A lunar eclipse does not occur at every full moon because

- W) the path of the Sun is inclined at an angle of 5° C to the ecliptic
- X) the orbit of the Moon is not a perfect circle
- Y) the plane of the Moon's orbit is at an angle to the plane of the Earth's orbit
- Z) a lunar eclipse cannot occur after sunset

ANSWER: Y) THE PLANE OF THE MOON'S ORBIT IS AT AN ANGLE TO THE PLANE OF THE EARTH'S ORBIT

TOSS-UP

18. *PHYSICS Multiple Choice* In a two- body collision, if the momentum of the system is conserved, then which of the following best describes the kinetic energy after the collision?

- W) must be less
- X) must also be conserved
- Y) may also be conserved
- Z) is doubled in value

ANSWER: Y) MAY ALSO BE CONSERVED

BONUS

18. *PHYSICS Multiple Choice* Vector A points north and vector B points east. If $C = B - A$, then vector C points

- W) north of east
- X) south of east
- Y) north of west
- Z) south of west

ANSWER: X) SOUTH OF EAST

TOSS-UP

19. *MATH Short Answer* When two quantities are in inverse proportion, what is their graph called?

ANSWER: HYPERBOLA

BONUS

19. *MATH Short Answer* The derivative of the velocity of an object is

ANSWER: ACCELERATION

TOSS-UP

20. *CHEMISTRY Short Answer* The resistance of a liquid to flow is called

ANSWER: VISCOSITY

BONUS

20. *CHEMISTRY Short Answer* How many electrons are shared in a single covalent bond?

ANSWER: TWO

TOSS-UP

21. *GENERAL SCIENCE Short Answer* In degrees, what is the separation of The Tropic of Cancer and the Arctic Circle from the equator and the North Pole, respectively?

ANSWER: 23.5 DEGREES (ACCEPT 23 OR 24 DEGREES)

BONUS

21. *GENERAL SCIENCE Short Answer* The zones that compose a mature soil are known as what?

ANSWER: HORIZONS

TOSS-UP

22. *CHEMISTRY Short Answer* An ion that is present, but does not participate in an oxidation-reduction reaction is what kind of ion?

ANSWER: SPECTATOR

BONUS

22. *CHEMISTRY Short Answer* What salt is formed when a solution of NaOH is neutralized by H₂SO₄?

ANSWER: Na₂SO₄ (ACCEPT: SODIUM SULFATE)

TOSS-UP

23. *BIOLOGY Short Answer* The vascular tissue found in the center of a root is

ANSWER: XYLEM

BONUS

23. *BIOLOGY Multiple Choice* In the human heart, the inherent rhythm of the SA node is about how many beats per minute?

- W) 40
- X) 60
- Y) 80
- Z) 100

ANSWER Z) 100

TOSS-UP

24. *EARTH SCIENCE Short Answer* What is the name for a location where the elevation of the Earth has been carefully measured and marked with a small metal plate?

ANSWER: BENCHMARK

BONUS

24. *EARTH SCIENCE Multiple Choice* The lithosphere consists of

- W) the crust
- X) the mantle
- Y) the lower mantle and the upper crust
- Z) the crust and the uppermost mantle

ANSWER: Z) THE CRUST AND THE UPPERMOST MANTLE

TOSS-UP

25. *GENERAL SCIENCE Short Answer* What is the term for the rate at which temperature falls with height in the troposphere?

ANSWER: LAPSE RATE

BONUS

25. *GENERAL SCIENCE Short Answer* After what sailor and scientist was the original (and since modified) scale (0 for calm, 12 for hurricane) for winds speeds named?

ANSWER: ADMIRAL FRANCIS BEAUFORT

REGIONAL ROUND 10B

TOSS-UP

1. *ASTRONOMY Multiple Choice* Which is the correct description of the Sun's location within the Milky Way?

- W) at the outer edge of the galactic bulge but in the plane of the disc
- X) in the disc but at its outer edge
- Y) above the disc and about one-third of the galactic radius from the center
- Z) in the disc and about one-half a galactic radius from the center

ANSWER: Z) IN THE DISC AND ABOUT ONE-HALF A GALACTIC RADIUS FROM THE CENTER

BONUS

1. *ASTRONOMY Multiple Choice* Cepheid stars are

- W) stars at an early stage in stellar evolution, pre-main-sequence
- X) members of binary systems, in which one star periodically eclipses the other
- Y) stars which pulsate in brightness, size, and temperature
- Z) white dwarf stars, late in their evolutionary life

ANSWER: Y) STARS WHICH PULSATE IN BRIGHTNESS, SIZE, AND TEMPERATURE

TOSS-UP

2. *PHYSICS Multiple Choice* Which of the following is an example of the type of force which acts at a distance?

- W) gravitational
- X) magnetic
- Y) electrical
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

2. *PHYSICS Multiple Choice* Calorimetry is based on the idea of

- W) conservation of mechanical energy
- X) conservation of thermal energy
- Y) conservation of momentum
- Z) conservation of electric energy

ANSWER: X) CONSERVATION OF THERMAL ENERGY

TOSS-UP

3. *GENERAL SCIENCE Multiple Choice* The opposite of aquatic is

- W) extraterrestrial
- X) biotic
- Y) hydrologic
- Z) terrestrial

ANSWER: Z) TERRESTRIAL

BONUS

3. *GENERAL SCIENCE Short Answer* What is the term for the boundary layer between the troposphere and the stratosphere?

ANSWER: TROPOPAUSE

TOSS-UP

4. *BIOLOGY Multiple Choice* In the neuron, the Nodes of Ranvier (Ron` - vee- ay) are interruptions in the

- W) dendritic endings
- X) myelin sheath
- Y) number of receptor cells
- Z) synaptic junctions

ANSWER: X) MYELIN SHEATH

BONUS

4. *BIOLOGY Multiple Choice* Which of the following is NOT a neurotransmitter?

- W) GABA
- X) dopamine
- Y) aldosterone
- Z) acetylcholine

ANSWER: Y) ALDOSTERONE

TOSS-UP

5. *PHYSICS Multiple Choice* When you make ice cubes, the entropy of the water

- W) decreases
- X) increases
- Y) is zero
- Z) is unchanged

ANSWER: W) DECREASES

BONUS

5. *PHYSICS Short Answer* What is the index of refraction of a material that transmits light at 75,000 kilometers per second?

ANSWER: 4

TOSS-UP

6. *EARTH SCIENCE Multiple Choice* For Earth, which statement is true?

- W) the core is primarily iron and magnesium
- X) the outer core and the mantle form the lithos
- Y) the lithosphere is a rigid layer
- Z) none of these

ANSWER: Y) THE LITHOSPHERE IS A RIGID LAYER

BONUS

6. *EARTH SCIENCE Multiple Choice* Which of the following divisions of geologic time is the longest?

- W) a period
- X) an epoch
- Y) an era
- Z) an eon

ANSWER: Z) AN EON

TOSS-UP

7. *BIOLOGY Multiple Choice* A synapse involves each of the following except the

- W) postsynaptic membrane
- X) presynaptic membrane
- Y) sarcolemma
- Z) terminal bouton (boo-tonn')

ANSWER: Y) SARCOLEMMA

BONUS

7. *BIOLOGY Multiple Choice* By the endosymbiotic theory, bacteria in host cells were the predecessors of

- W) chloroplasts and mitochondria
- X) chloroplasts and nuclei
- Y) mitochondria and ribosomes
- Z) nuclei and ribosomes

ANSWER: W) CHLOROPLASTS AND MITOCHONDRIA

TOSS-UP

8. *CHEMISTRY Short Answer* How many half- filled orbitals are there in a bromine atom?

ANSWER: ONE

BONUS

8. *CHEMISTRY Short Answer* A particular poisoned catalyst used in alkyne reactions, made of finely divided palladium coated with quinoline and absorbed on barium sulfate is known as what kind of catalyst?

ANSWER: LINDLAR

TOSS-UP

9. *ASTRONOMY Multiple Choice* The presence of hydrogen in the atmospheres of the gas giants suggests that these planets have

- W) a large mass and low temperature
- X) a small mass and low temperature
- Y) a large mass and high temperature
- Z) a small mass and high temperature

ANSWER: W) A LARGE MASS AND LOW TEMPERATURE

BONUS

9. *ASTRONOMY Multiple Choice* Which of the following is one of the many contributions made by Galileo to astronomy?

- W) he discovered that the planets move around the Sun in elliptical orbits
- X) he developed a theory of gravity that could explain orbital motion
- Y) he used a telescope to observe the heavens, thereby reinforcing the notion of heliocentricity
- Z) he made extensive and detailed observations of the positions of planets

ANSWER: Y) HE USED A TELESCOPE TO OBSERVE THE HEAVENS, THEREBY REINFORCING THE NOTION OF HELIOCENTRICITY

TOSS-UP

10. *EARTH SCIENCE Multiple Choice* Stream pebbles become rounded by

- W) exfoliation
- X) pressure relief
- Y) dissolution
- Z) abrasion

ANSWER: Z) ABRASION

BONUS

10. *EARTH SCIENCE Multiple Choice* Which of the following are bowl-shaped basins resulting from plucking on the side of a mountain?

- W) Loess (Lō-ess) deposits
- X) Deltas
- Y) Cirques
- Z) Striations

ANSWER: Y) CIRQUES

TOSS-UP

11. *CHEMISTRY Short Answer* What is the approximate effective nuclear charge in the fourth shell of an argon atom?

ANSWER: ZERO

BONUS

11. *CHEMISTRY Short Answer* A suspension in which a solute like phase is dispersed throughout a solvent like substance is known as a

ANSWER: COLLOID

TOSS-UP

12. *GENERAL SCIENCE Multiple Choice* All of the following chemicals could be extracted from the ocean with today's technology at a profit except

- W) magnesium
- X) zinc
- Y) bromine
- Z) sodium chloride

ANSWER X) ZINC

BONUS

12. *GENERAL SCIENCE Short Answer* What is the term for a substance that prevents the formation of blood clots?

ANSWER: ANTICOAGULANT

TOSS-UP

13. *CHEMISTRY Multiple Choice* What heteroatom is characteristic of an amine?

- W) oxygen
- X) nitrogen
- Y) chlorine
- Z) sulfur

ANSWER: X) NITROGEN

BONUS

13. *CHEMISTRY Multiple Choice* The difference between the observed mass of a nucleus and the sum of the masses of the nucleons is called the

- W) fission factor
- X) fusion factor
- Y) mass defect
- Z) binding energy

ANSWER: Y) MASS DEFECT

TOSS-UP

14. *ASTRONOMY Multiple Choice* If the Moon formed initially in orbit around the Earth, we would expect its orbit to be

- W) in the Earth's equatorial plane
- X) in the plane of the ecliptic
- Y) over the Earth's poles
- Z) the same period as the Earth's rotation

ANSWER: W) IN THE EARTH'S EQUATORIAL PLANE

BONUS

14. *ASTRONOMY Multiple Choice* What is stellar nucleosynthesis?

- W) the formation of elements inside stars
- X) the formation of stars from a nucleus of contracting material
- Y) the formation of white dwarfs, neutron stars, and black holes from stars
- Z) the process by which stars form interstellar dust

ANSWER: W) THE FORMATION OF ELEMENTS INSIDE STARS

TOSS-UP

15. *COMPUTER SCIENCE Multiple Choice* In 1975, the first personal computer was marketed in kit form, with memory of 256 bytes. It was the

- W) MITS Altair 8800
- X) Apple II
- Y) IBM PC
- Z) Apple Iie

ANSWER: W) MITS ALTAIR 8800

BONUS

15. *COMPUTER SCIENCE Multiple Choice* In computer graphics, changing the shape of an object made up of connected lines by “grabbing” a point on an anchored line and “pulling” it to the new location is called what?

- W) running around
- X) rubber banding
- Y) grabber
- Z) controlling

ANSWER: X) RUBBER BANDING

TOSS-UP

16. *CHEMISTRY Multiple Choice* HClO_4 is considered

- W) a weak acid
- X) a weak base
- Y) a strong acid
- Z) a strong base

ANSWER: Y) A STRONG ACID

BONUS

16. *CHEMISTRY Multiple Choice* The following substance likely to be least ionic in character is

- W) LiBr
- X) CaBr_2
- Y) AlCl_3
- Z) CaI_2

ANSWER: Y) AlCl_3

TOSS-UP

17. *EARTH SCIENCE Multiple Choice* Rock formed by the cooling of magma or lava is

- W) sediment
- X) igneous rock
- Y) sedimentary rock
- Z) metamorphic rock

ANSWER: X) IGNEOUS ROCK

BONUS

17. *EARTH SCIENCE Multiple Choice* A layer of volcanic ash has been discovered throughout a wide region. The ash represents a

- W) unconformity
- X) index fossil
- Y) key bed
- Z) organic remain

ANSWER: Y) KEY BED

TOSS-UP

18. *COMPUTER SCIENCE Short Answer* When using the internet, users sometimes employ shorthand for commonly used phrases. What does the phrase AFAIK mean?

ANSWER: AS FAR AS I KNOW

BONUS

18. *COMPUTER SCIENCE Short Answer* What are the three kinds of hyperlinks?

ANSWER: TEXT, IMAGE, AND IMAGE MAP

TOSS-UP

19. *MATH Multiple Choice* Which of the following concepts in experimental design are not key?

- W) randomization
- X) blocking
- Y) control
- Z) stratifying

ANSWER: Z) STRATIFYING

BONUS

19. *MATH Multiple Choice* If $f(x) = x + 1 - 5/x$, then $f'(x)$ equals (read as: the first derivative of F of X)

- W) $1 - 5/x$
- X) $x + 5/x^2$
- Y) $1 - 5/x^2$
- Z) $1 + 5/x^2$

ANSWER: Z) $1 + 5/x^2$

TOSS-UP

20. *ASTRONOMY Multiple Choice* Which of these environmental problems hamper astronomical observations?

- W) scattered light in the sky
- X) increasing emission of radio signals
- Y) particulate matter in the atmosphere
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

20. *ASTRONOMY Multiple Choice* The biggest single, connected structures are

- W) supernova remnants
- X) giant elliptical galaxies
- Y) double-lobed radio galaxies
- Z) quasars

ANSWER: Y) DOUBLE-LOBED RADIO GALAXIES

TOSS-UP

21. *CHEMISTRY Short Answer* What theory (limited to aqueous systems) defines an acid as a compound that liberates hydrogen ions and a base as a compound that liberates hydroxide ions?

ANSWER: ARRHENIUS THEORY

BONUS

21. *CHEMISTRY Multiple Choice* Which of the following should be the strongest reducing agent?

- W) Iron
- X) Ruthenium
- Y) Osmium
- Z) Rhenium

ANSWER: W) IRON

TOSS-UP

22. *BIOLOGY Short Answer* What part of the wheat grain is composed of starch?

ANSWER: ENDOSPERM

BONUS

22. *BIOLOGY Multiple Choice* Adrenocorticotrophic hormone (ACTH) is secreted by the

- W) adrenal cortex
- X) anterior pituitary
- Y) posterior pituitary
- Z) thyroid

ANSWER: X) ANTERIOR PITUITARY

TOSS-UP

23. *COMPUTER SCIENCE Short Answer* What is the device, connected between a computer and a power source called that ensures that the electrical flow to the computer is not interrupted by a blackout or power surge?

ANSWER: UPS (ACCEPT: UNINTERRUPTIBLE POWER SUPPLY)

BONUS

23. *COMPUTER SCIENCE Short Answer* What is the screen technology used for flat-panel display monitors?

ANSWER: LIQUID CRYSTAL DISPLAY (LCD)

TOSS-UP

24. *ASTRONOMY Short Answer* A large, spherical cluster of stars located in the halo of the galaxy is a type of cluster called what?

ANSWER: GLOBULAR CLUSTER

BONUS

24. *ASTRONOMY Multiple Choice* Which of the following objects would be found on the Moon?

- W) meteoroids
- X) meteors
- Y) meteorites
- Z) asteroids

ANSWER: Y) METEORITES

TOSS-UP

25. *GENERAL SCIENCE Short Answer* What is the study of groundwater called?

ANSWER: HYDROLOGY (ALSO ACCEPT HYDROGEOLOGY)

BONUS

25. *GENERAL SCIENCE Short Answer* What is the name of the colorless gas, when mixed with oxygen burns at a temperature of about 3500 degrees C and is used in welding?

ANSWER: ACETYLENE

REGIONAL ROUND 11B

TOSS-UP

1. *EARTH SCIENCE Short Answer* What is heat energy that comes from the earth called?

ANSWER: GEOTHERMAL ENERGY

BONUS

1. *EARTH SCIENCE Short Answer* Who was the first scientist to state the theory of continental drift?

ANSWER: (ALFRED) WEGENER

TOSS-UP

2. *CHEMISTRY Short Answer* Which stable element has the lowest electronegativity?

ANSWER: CESIUM

BONUS

2. *CHEMISTRY Short Answer* Which state of matter is characterized by low density and high compressibility?

ANSWER: GAS

TOSS-UP

3. *ASTRONOMY Multiple Choice* Jupiter's atmosphere is mainly hydrogen and

- W) nitrogen
- X) helium
- Y) water vapor
- Z) carbon dioxide

ANSWER: X) HELIUM

BONUS

3. *ASTRONOMY Multiple Choice* Saturn's rings are located

- W) close to the planet in a region where any large satellites would break up from tidal forces
- X) at a large distance from the planet near several large satellites
- Y) in an orbit that goes directly over the north and south poles of the planet
- Z) nowhere - Saturn does not have any rings

ANSWER: W) CLOSE TO THE PLANET IN A REGION WHERE ANY LARGE SATELLITES WOULD BREAK UP FROM TIDAL FORCES

TOSS-UP

4. *BIOLOGY Multiple Choice* Gametogenesis is

- W) the pairing of homologous chromosomes
- X) the formation of sex cells
- Y) the fusion of gametes
- Z) a process that occurs only in asexually reproducing forms

ANSWER: X) THE FORMATION OF SEX CELLS

BONUS

4. *BIOLOGY Short Answer* A karyotype from a human somatic cell normally has how many chromosomes?

ANSWER: 46

TOSS-UP

5. *PHYSICS Multiple Choice* Which of the following is not a vector?

- W) average velocity
- X) net displacement
- Y) instantaneous speed
- Z) final acceleration

ANSWER: Y) INSTANTANEOUS SPEED

BONUS

5. *PHYSICS Short Answer* A car with mass M traveling at speed V has kinetic energy KE . What is the kinetic energy of a second car that has half the mass and twice the speed of the first car?

ANSWER: $2KE$

TOSS-UP

6. *ASTRONOMY Short Answer* Which is the only planet whose orbit is more eccentric than Mercury's?

ANSWER: PLUTO

BONUS

6. *ASTRONOMY Multiple Choice* Which of the following is the Hubble Law?

- W) the greater the distance to a galaxy, the greater its redshift
- X) the greater the distance to a galaxy, the fainter it is
- Y) the more distant a galaxy is, the younger it appears
- Z) most galaxies belong to a cluster; most clusters are part of a super cluster

ANSWER: W) THE GREATER THE DISTANCE TO A GALAXY, THE GREATER ITS REDSHIFT

TOSS-UP

7. *MATH Multiple Choice* A system for the representation of a point in space in terms of its distance, measured along a set of mutually perpendicular axes is called

- W) cartesian coordinates
- X) polar coordinates
- Y) cassini coordinates
- Z) weissmann coordinates

ANSWER: W) CARTESIAN COORDINATES

BONUS

7. *MATH Multiple Choice* When the marginal cost of production changes from decreasing to increasing, the second derivative of the cost function is either zero or undefined, this point is called

- W) critical point
- X) point of inflection
- Y) minima
- Z) maxima

ANSWER: X) POINT OF INFLECTION

TOSS-UP

8. *CHEMISTRY Multiple Choice* Which of the following series of elements is listed in order of increasing atomic radius?

- W) Sodium, Magnesium, Aluminum, Silicon
- X) Carbon, Nickel, Oxygen, Flourine
- Y) Oxygen, Sulfur, Selenium, Technetium
- Z) Iodine, Bromine, Chlorine, Flourine

ANSWER: Y) OXYGEN, SULFUR, SELENIUM, TECHNETIUM

BONUS

8. *CHEMISTRY Multiple Choice* Based upon the electronegativities of elements, which of the following bonds should be the most polar?

- W) Silicon-Chlorine
- X) Silicon-Sulfur
- Y) Silicon-Phosphorus
- Z) Silicon-Carbon

ANSWER: W) SILICON-CHLORINE

TOSS-UP

9. *MATH Multiple Choice* A number that can be expressed in the form p/q (read as: p divided by q), where p and q are integers, and q is not equal to zero, is a

- W) integer
- X) irrational number
- Y) imaginary number
- Z) rational number

ANSWER: Z) RATIONAL NUMBER

BONUS

9. *MATH Multiple Choice* An assumption or supposition used in an argument is a

- W) hypotenuse
- X) hypocycloid
- Y) hyperspace
- Z) hypothesis

ANSWER: Z) HYPOTHESIS

TOSS-UP

10. *GENERAL SCIENCE Short Answer* Electric transmission lines are typically rated 69 KVa and above. What is the term for electric lines operating at 34.5 KVa and below?

ANSWER: DISTRIBUTION LINES

BONUS

10. *GENERAL SCIENCE Short Answer* What is the term for an orifice in the earth's surface that erupts steam and boiling water intermittently?

ANSWER: GEYSER

TOSS-UP

11. *CHEMISTRY Multiple Choice* The process among the following that is exothermic is

- W) melting ice cream
- X) burning a log
- Y) baking a cake
- Z) defogging the windshield

ANSWER: X) BURNING A LOG

BONUS

11. *CHEMISTRY Multiple Choice* Which of the following ligands is most likely to form a high-spin octahedral complex with cobalt (II)?

- W) CN^-
- X) I^-
- Y) NO_2^-
- Z) CO

ANSWER: X) I^-

TOSS-UP

12. *MATH Multiple Choice* In statistics, the mean measures

- W) a standard distance
- X) a normal distance
- Y) central tendency
- Z) dispersion

ANSWER: Y) CENTRAL TENDENCY

BONUS

12. *MATH Short Answer* Relative to the graph of $y = x^3$, the graph of $y = 2x^3$ is changed in what way?

ANSWER: STRETCHED VERTICALLY BY THE FACTOR 2

TOSS-UP

13. *ASTRONOMY Multiple Choice* The Zodiacal Light is due to

- W) scattering of Sunlight from interplanetary dust particles
- X) refraction of Sunlight by the Earth's Atmosphere
- Y) scattering of Sunlight by ice crystals in the stratosphere
- Z) multiple reflection of Sunlight between the Moon and the Earth

ANSWER: W) SCATTERING OF SUNLIGHT FROM INTERPLANETARY DUST PARTICLES

BONUS

13. *ASTRONOMY Multiple Choice* Which event marks the birth of a star?

- W) Fusion of hydrogen atoms into helium atoms
- X) Collapse of an interstellar cloud
- Y) Formation of a photosphere
- Z) Instability in an interstellar cloud

ANSWER: W) FUSION OF HYDROGEN ATOMS INTO HELIUM ATOMS

TOSS-UP

14. *CHEMISTRY Multiple Choice* Synthetic polymers are formed by

- W) pyrolysis
- X) cracking
- Y) halogenation
- Z) chain reaction

ANSWER: Z) CHAIN REACTION

BONUS

14. *CHEMISTRY Short Answer* What is the highest possible oxidation state for molybdenum, Mo?

ANSWER: +6

TOSS-UP

15. *BIOLOGY Short Answer* The vascular tissue in plants that transports water and minerals from the roots to the photosynthesizing parts of the plant is called

ANSWER: XYLEM

BONUS

15. *BIOLOGY Multiple Choice* The eustachian tube functions

- W) as a pressure valve
- X) for body balance
- Y) to detect sound waves
- Z) as a connection between the ovary and the uterus

ANSWER: W) AS A PRESSURE VALVE

TOSS-UP

16. *PHYSICS Short Answer* A 112 pound box rests on the floor of a freight elevator which starts from rest and accelerates downward at 4.9 meters per second squared for 5 seconds. What is the force in Newtons that the box exerts on the floor during the descent?

ANSWER: 250

BONUS

16. *PHYSICS Multiple Choice* Consider a point on a bicycle wheel as the wheel makes exactly four complete revolutions about a fixed axis. Compare the linear and angular displacement of the point.

- W) both are zero
- X) only the angular displacement is zero
- Y) only the linear displacement is zero
- Z) neither is zero

ANSWER: Y) ONLY THE LINEAR DISPLACEMENT IS ZERO

TOSS-UP

17. *ASTRONOMY Multiple Choice* Which Spectral class of stars represents the hottest stars?

- W) O type
- X) A type
- Y) G type
- Z) M type

ANSWER: W) O TYPE

BONUS

17. *ASTRONOMY Multiple Choice* Pulsars are objects that emit extremely regular radio signals. These objects are

- W) neutron stars
- X) supernovas
- Y) protostars
- Z) red giants

ANSWER: W) NEUTRON STARS

TOSS-UP

18. *GENERAL SCIENCE Short Answer* What is the name for a shallow pond or pool completely or almost completely separated from the sea?

ANSWER: LAGOON

BONUS

18. *GENERAL SCIENCE Multiple Choice* The level of stress to which a material can be subjected and still recover to its original shape or volume when the stress is removed is called:

- W) Elastic limit
- X) Elastic stress
- Y) Elastic rebound
- Z) Elasticity

ANSWER: W) ELASTIC LIMIT

TOSS-UP

19. *PHYSICS Multiple Choice* The work done by static friction is always

- W) positive
- X) negative
- Y) along the surface
- Z) zero

ANSWER: Z) ZERO

BONUS

19. *PHYSICS Short Answer* An average force of 2500 N is applied for 1.0 milliseconds to a 10 gram bullet moving with a speed of 250 meters per second as it passes through a target. The final speed of the bullet is

ANSWER: ZERO

TOSS-UP

20. *ASTRONOMY Short Answer* One of the oldest constellations is associated with a legendary early king of Athens and is supposed to be a charioteer. Name it.

ANSWER: AURIGA

BONUS

20. *ASTRONOMY Multiple Choice* The nucleus of our galaxy is composed primarily of

- W) young, hot stars
- X) old, cool stars
- Y) interstellar gas and dust
- Z) planetary nebulae

ANSWER: X) OLD, COOL STARS

TOSS-UP

21. *BIOLOGY Short Answer* What two scientists demonstrated the possibility of producing organic compounds from gases and water if the mixture is heated and bombarded with a continuous spark discharge?

ANSWER: STANLEY MILLER AND HAROLD UREY (ACCEPT: MILLER AND UREY)

BONUS

21. *BIOLOGY Short Answer* What enzyme helps align complementary nucleotides and join the phosphates and sugar molecules in a newly forming DNA strand?

ANSWER: DNA POLYMERASE

TOSS-UP

22. *MATH Short Answer* If $f(x) = x^n$ (read as: x to the nth power), then $f^{(n+1)}(x)$ equals ? (read as: the $(n + 1)^{\text{st}}$ derivative of $f(x)$).

ANSWER: 0

BONUS

22. *MATH Multiple Choice* A point at which the first derivative changes from decreasing to increasing, and second derivative of the cost function is either zero or undefined, is called a

- W) critical point
- X) point of inflection
- Y) minimum
- Z) maximum

ANSWER: X) POINT OF INFLECTION

TOSS-UP

23. *ASTRONOMY Short Answer* The orbit of which planet is so eccentric that it can actually cross the orbit of Neptune?

ANSWER: PLUTO

BONUS

23. *ASTRONOMY Multiple Choice* The effects of gravity acting with different force on opposite sides of a planet are called

- W) inertia
- X) orbital forces
- Y) precession
- Z) tidal forces

ANSWER: Z) TIDAL FORCES

TOSS-UP

24. *PHYSICS Short Answer* The initial velocity of a projectile is v which produces a range R . If the initial velocity is increased to $2v$ while the angle is unchanged, what will the range be?

ANSWER: $4R$

BONUS

24. *PHYSICS Multiple Choice* If $p = mv$, then $p^2 / 2m$ is

- W) impulse
- X) velocity
- Y) force
- Z) kinetic energy

ANSWER: Y) FORCE

TOSS-UP

25. *CHEMISTRY Short Answer* The condition of a molecule containing the most atoms possible (made up of single bonds) is called

ANSWER: SATURATION

BONUS

25. *CHEMISTRY Multiple Choice* The following compound with the greatest lattice energy is

- W) KBr
- X) K₂O
- Y) MgO
- Z) MgBr₂

ANSWER: Y) MgO

REGIONAL ROUND 12B

TOSS-UP

1. *MATH Multiple Choice* For any process in which the rate of change of a quantity is proportional to the quantity itself, the mathematical function describing the process will be

- W) linear
- X) logarithmic
- Y) exponential
- Z) parabolic

ANSWER: Y) EXPONENTIAL

BONUS

1. *PHYSICS Short Answer* A very light cart holding a 300N box is moved at constant velocity across a 15m level surface. What is the net work done in the process?

ANSWER: ZERO

TOSS-UP

2. *EARTH SCIENCE Multiple Choice* Acid mine drainage is related to the presence of the mineral

- W) olivine
- X) calcite
- Y) hematite
- Z) pyrite

ANSWER: Z) PYRITE

BONUS

2. *EARTH SCIENCE Short Answer* What is the name of balloon-mounted packages of instruments which measure temperature, humidity, and wind through the troposphere into the stratosphere?

ANSWER: RADIOSONDES

TOSS-UP

3. *ASTRONOMY Multiple Choice* Space travelers looking out from the front of their spacecraft would note that the light emitted from the star system toward which they were moving seemed to be

- W) getting redder
- X) getting bluer
- Y) staying the same
- Z) hotter

ANSWER: X) GETTING BLUER

BONUS

3. *ASTRONOMY Multiple Choice* In the HR diagram, what is the approximate position of the Sun?

- W) bottom left
- X) top right
- Y) top left
- Z) center

ANSWER: Z) CENTER

TOSS-UP

4. *MATH Multiple Choice* The x-coordinate of the point at which graph of a linear equation crosses the x-axis is called the

- W) zero point
- X) maxima
- Y) minima
- Z) x-intercept

ANSWER: Z) X-INTERCEPT

BONUS

4. *MATH Multiple Choice* Which of the following types of function is NOT a transcendental function?

- W) trigonometric
- X) algebraic
- Y) logarithmic
- Z) exponential

ANSWER: X) ALGEBRAIC

TOSS-UP

5. *PHYSICS Multiple Choice* The rate at which work is done is equivalent to which of the following?

- W) increase in potential energy
- X) thermal energy
- Y) potential energy
- Z) power

ANSWER: Z) POWER

BONUS

5. *PHYSICS Multiple Choice* Which point is nearest the x-axis?

- W) (-3,4)
- X) (4,5)
- Y) (-5,3)
- Z) (5, -2)

ANSWER: Z) (5, -2)

TOSS-UP

6. *CHEMISTRY Multiple Choice* The number of particles that come together to form the activated complex is

- W) the reaction order
- X) the reaction profile
- Y) the molecularity of the process
- Z) none of the above

ANSWER: Y) THE MOLECULARITY OF THE PROCESS

BONUS

6. *CHEMISTRY Multiple Choice* The most common oxidation state for ions of the inner transition elements is

- W) +2
- X) +3
- Y) +5
- Z) +7

ANSWER: X) +3

TOSS-UP

7. *EARTH SCIENCE Multiple Choice* What information can scientists find out by studying P waves and S waves?

- W) how strong an earthquake was
- X) the amount of damage an earthquake caused
- Y) how far away an earthquake occurred
- Z) the speed of the L waves

ANSWER: Y) HOW FAR AWAY AN EARTHQUAKE OCCURRED

BONUS

7. *EARTH SCIENCE Multiple Choice* The force that moves crustal plates is

- W) the wind
- X) running water
- Y) convection currents
- Z) gravity

ANSWER: Y) CONVECTION CURRENTS

TOSS-UP

8. *PHYSICS Multiple Choice* If both mass and velocity of a ball are tripled, the kinetic energy is increased by a factor of

- W) 3
- X) 6
- Y) 9
- Z) 27

ANSWER: Z) 27

BONUS

8. *PHYSICS Short Answer* Suppose a planet exists that has a radius that is twice that of earth and a mass that is four times as great. If the acceleration due to gravity is g on earth, what will it be on the other planet?

ANSWER: g

TOSS-UP

9. *BIOLOGY Multiple Choice* Cytokinesis is

- W) a chromosomal mutation
- X) cytoplasmic division
- Y) muscle cell movement
- Z) a form of cellular locomotion

ANSWER: X) CYTOPLASMIC DIVISION

BONUS

9. *BIOLOGY Short Answer* What disease develops due to the autoimmune destruction of the myelin sheath around a nerve?

ANSWER: MULTIPLE SCLEROSIS

TOSS-UP

10. *ASTRONOMY Multiple Choice* Because of tidal forces

- W) the Moon's gravity slows the Earth's rotation
- X) the Earth has locked the Moon's rotation
- Y) the Earth accelerates the Moon in its orbit, throwing it into a higher orbit
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

10. *ASTRONOMY Multiple Choice* Which of the following represents the approximate composition of the Earth's atmosphere

- W) 21% Nitrogen, 78% Oxygen, 1% everything else
- X) 78% Carbon Dioxide, 21% oxygen, 1% everything else
- Y) 33% Nitrogen, 33% Oxygen, 33% Carbon Dioxide, 1% everything else
- Z) 78% Nitrogen, 21% Oxygen, 1% everything else

ANSWER: Z) 78% NITROGEN, 21% OXYGEN, 1% EVERYTHING ELSE

TOSS-UP

11. *CHEMISTRY Short Answer* How many moles of sulfate ions are present in 1.0 Liters of 0.5 Molar Li_2SO_4 ?

ANSWER: 0.5 MOL

BONUS

11. *CHEMISTRY Short Answer* An anion of chlorine or other halogen is known as this ion

ANSWER: HALIDE

TOSS-UP

12. *BIOLOGY Short Answer* What are the most extensively branching blood vessels?

ANSWER: CAPILLARIES

BONUS

12. *BIOLOGY Short Answer* The presence of chyme in the small intestine stimulates the release of what hormone?

ANSWER: SECRETIN

TOSS-UP

13. *EARTH SCIENCE Multiple Choice* What holds the mercury in a column in a mercury barometer?

- W) heavy mercury
- X) mercury pressure
- Y) the weight of mercury
- Z) air pressure

ANSWER: Z) AIR PRESSURE

BONUS

13. *EARTH SCIENCE Multiple Choice* Approximately how many different minerals have been identified on earth?

- W) 400
- X) 2000
- Y) 4000
- Z) 10,000

ANSWER: Y) 4000

TOSS-UP

14. *COMPUTER SCIENCE Short Answer* What is the term for errors or mistakes found in the compilation or execution of a software program that are typically human faults?

ANSWER: BUGS

BONUS

14. *COMPUTER SCIENCE Multiple Choice* How many bits of color information per pixel does Graphics Interchange Format support?

- W) 8
- X) 16
- Y) 24
- Z) 32

ANSWER: W) 8

TOSS-UP

15. *CHEMISTRY Multiple Choice* An alkaloid is an organic chemical that always contains which heteroatom

- W) oxygen
- X) sulfur
- Y) chlorine
- Z) nitrogen

ANSWER: Z) NITROGEN

BONUS

15. *CHEMISTRY Multiple Choice* Which of the following materials is put into a nuclear reactor to slow the chain reaction?

- W) heavy water
- X) moderators
- Y) control rods
- Z) reflectors

ANSWER: Y) CONTROL RODS

TOSS-UP

16. *BIOLOGY Multiple Choice* What circuit is between the heart and lungs?

- W) cardiac
- X) coronary
- Y) lymphatic
- Z) pulmonary

ANSWER: Z) PULMONARY

BONUS

16. *BIOLOGY Multiple Choice* A virus is characterized by all but which one of the following?

- W) enzymes of respiration
- X) nucleic acid core
- Y) noncellular organization
- Z) protein coat

ANSWER: W) ENZYMES OF RESPIRATION

TOSS-UP

17. *ASTRONOMY Multiple Choice* Lunar surface features clearly indicate

- W) extensive erosion processes from wind and rain
- X) currently active volcanoes
- Y) current continental drift activity
- Z) none of the above

ANSWER: Z) NONE OF THE ABOVE

BONUS

17. *ASTRONOMY Multiple Choice* What was one of the contributions made to astronomy by Johannes Kepler?

- W) he discovered that the planets move around the Sun in elliptical orbits
- X) he developed a theory of gravity that could explain orbital motion
- Y) he said that the Earth is not at the center of the universe
- Z) he used a telescope to observe the heavens, thereby reinforcing the notion of heliocentricity

ANSWER: W) HE DISCOVERED THAT THE PLANETS MOVE AROUND THE SUN IN ELLIPTICAL ORBITS

TOSS-UP

18. *CHEMISTRY Short Answer* What term describes the energy change accompanying a mole of electrons being added to a mole of gaseous atoms or ions?

ANSWER: ELECTRON AFFINITY

BONUS

18. *CHEMISTRY Short Answer* A material capable of being easily fragmented into free radicals, which in turn initiate a free-radical reaction is known as a

ANSWER: INITIATOR

TOSS-UP

19. *ASTRONOMY Multiple Choice* The Oort Cloud is thought to be

- W) The cloud of gas and dust from which our solar system formed
- X) A cloud of debris that occasionally encounters the Earth, causing a meteor shower
- Y) A cloud of comets surrounding the solar system
- Z) A cloud of asteroids moving between the orbits of Mars and Jupiter

ANSWER: Y) A CLOUD OF COMETS SURROUNDING THE SOLAR SYSTEM

BONUS

19. *ASTRONOMY Multiple Choice* In catastrophic theories, material for the planets was provided by

- W) a captured gas cloud passing in its vicinity
- X) matter stripped by tidal forces from the sun or a passing star
- Y) material lost from comets
- Z) the collapsing sun

ANSWER: X) MATTER STRIPPED BY TIDAL FORCES FROM THE SUN OR A PASSING STAR

TOSS-UP

20. *BIOLOGY Multiple Choice* Which of the following characteristics is NOT true of all animal phyla?

- W) are composed of one or more cells
- X) have metabolic systems
- Y) are autotrophic
- Z) contain DNA

ANSWER: Y) ARE AUTOTROPHIC

BONUS

20. *BIOLOGY Short Answer* What hormone stimulates the gallbladder to contract?

ANSWER: CCK (CHOLECYSTYKININ)

TOSS-UP

21. *CHEMISTRY Short Answer* What is the molecular formula for sodium dichromate?

ANSWER: $\text{Na}_2\text{Cr}_2\text{O}_7$

BONUS

21. *CHEMISTRY Multiple Choice* Decay of some radionuclides to stable nuclides requires steps called

- W) induced nuclear reactions
- X) a radioactive decay series
- Y) a band of stability
- Z) a branching chain

ANSWER: X) A RADIOACTIVE DECAY SERIES

TOSS-UP

22. *COMPUTER SCIENCE Short Answer* In encryption, what is the process of verifying the identity of a respondent?

ANSWER: AUTHENTICATION

BONUS

22. *COMPUTER SCIENCE Multiple Choice* What is the term used to describe the extension of a corporate Intranet using WWW technology to facilitate communications with the corporation's suppliers and customers?

- W) intranet
- X) extranet
- Y) suppnet
- Z) extrasup

ANSWER: X) EXTRANET

TOSS-UP

23. *BIOLOGY Short Answer* The excretory organ in the crustacean is called the

ANSWER: GREEN GLAND

BONUS

23. *BIOLOGY Short Answer* Erythropoietin is produced where in the body?

ANSWER: KIDNEY

TOSS-UP

24. *GENERAL SCIENCE Short Answer* What is the term for the minute impurities in air around which rain drops form?

ANSWER: CONDENSATION NUCLEI

BONUS

24. *GENERAL SCIENCE Short Answer* What is the term for a material which has the ability to extract certain substances from gases, liquids, or solids by causing the substance to adhere to its internal surface without changing it physically or chemically?

ANSWER: ADSORBENT

TOSS-UP

25. *ASTRONOMY Short Answer* What was the name of the first successful spacecraft mission to Venus?

ANSWER: MARINER 2

BONUS

25. *ASTRONOMY Multiple Choice* When an Earth scientist says that the Earth is "differentiated", she means that

- W) the ground beneath our feet gets hotter and denser as you go inward
- X) the radioactive heating of the Earth takes place at a slower rate today than it did billions of years ago
- Y) earth is different from any other planet in the solar system
- Z) earth's magnetic field undergoes reversals

ANSWER: W) THE GROUND BENEATH OUR FEET GETS HOTTER AND DENSER AS YOU GO INWARD

REGIONAL ROUND 13B

TOSS-UP

1. *BIOLOGY Short Answer* RNA makes DNA by what process?

ANSWER: REVERSE TRANSCRIPTION

BONUS

1. *BIOLOGY Short Answer* Disposal of CO₂ is controlled by what part of the brain?

ANSWER: MEDULLA

TOSS-UP

2. *GENERAL SCIENCE Short Answer* What is the name for the system in the US to designate wire diameter in electrical wiring or the thickness of metal sheet material?

ANSWER: AMERICAN WIRE GAUGE

BONUS

2. *GENERAL SCIENCE Short Answer* What compound can be created by replacing hydrogen atoms of a hydrocarbon with bromine or other halogen atoms for use in items such as fire extinguishers, yet has been found to be destructive to the earth's ozone layer?

ANSWER: HALONS

TOSS-UP

3. *CHEMISTRY Multiple Choice* Colligative properties depend on

- W) the chemical properties of the solute
- X) the chemical properties of the solvent
- Y) the number of particles dissolved
- Z) the molar mass of the solute

ANSWER: Y) THE NUMBER OF PARTICLES DISSOLVED

BONUS

3. *CHEMISTRY Short Answer* The carbon of the carbonyl is bonded to how many atoms?

ANSWER: THREE

TOSS-UP

4. *GENERAL SCIENCE Short Answer* What is the term for a pronounced bend in layers of rock?

ANSWER: FOLD

BONUS

4. *GENERAL SCIENCE Short Answer* What type of steel contains chromium, nickel, or other elements to impart particular physical, mechanical, or chemical properties?

ANSWER: ALLOY STEEL

TOSS-UP

5. *MATH Multiple Choice* The discovery by Newton and Leibniz, now called the Fundamental Theorem of Calculus, describes the

- W) connection between integration and differentiation
- X) mean value for continuous functions
- Y) existence of Riemann sums
- Z) existence of limits

ANSWER: W) CONNECTION BETWEEN INTEGRATION AND DIFFERENTIATION

BONUS

5. *MATH Short Answer* The focus of the parabola $4y = x^2$ is at the point

ANSWER: (0,1) (read: zero - one)

TOSS-UP

6. *BIOLOGY Short Answer* Which single- celled animals move by means of pseudopodia?

ANSWER: AMOEBAS

BONUS

6. *BIOLOGY Multiple Choice* E. coli normally lives in the large intestine. It is a:

- W) bacterium
- X) fungus
- Y) protozoan
- Z) virus

ANSWER: W) BACTERIUM

TOSS-UP

7. *EARTH SCIENCE Short Answer* What is the plowing of a hill along lines of equal elevation rather than up and down called?

ANSWER: CONTOUR PLOWING

BONUS

7. *EARTH SCIENCE Multiple Choice* Which of the following were an important group of animals during the Mesozoic?

- W) Trilobites
- X) jellyfish
- Y) dinosaurs
- Z) mammals

ANSWER: Y) DINOSAURS

TOSS-UP

8. *CHEMISTRY Multiple Choice* The solid in this list NOT expected to dissolve readily in acid is

- W) AgCl
- X) Mg(OH)₂
- Y) CaCO₃
- Z) MnSO₃

ANSWER: W) AgCl

BONUS

8. *CHEMISTRY Multiple Choice* Applying a pressure greater than the osmotic pressure to a solution in contact with a semipermeable membrane to force solvent from the solution is

- W) deliquescence
- X) osmosis
- Y) the Tyndall effect
- Z) reverse osmosis

ANSWER: Z) REVERSE OSMOSIS

TOSS-UP

9. *GENERAL SCIENCE Short Answer* What is the name for the study of the interactions of organisms with one another and with their physical environments?

ANSWER: ECOLOGY

BONUS

9. *GENERAL SCIENCE Short Answer* A person flying over the Chernobyl site two days after the explosion would most probably have experienced what type of exposure to radioactive substances?

ANSWER: ACUTE

TOSS-UP

10. *BIOLOGY Multiple Choice* Which of the following is not one of the three parts of the hindbrain?

- W) pons
- X) thalamus
- Y) medulla oblongata
- Z) cerebellum

ANSWER: X) THALAMUS

BONUS

10. *BIOLOGY Short Answer* Down's Syndrome is trisomy of which chromosome?

ANSWER: #21

TOSS-UP

11. *GENERAL SCIENCE Short Answer* What is the name for the effect caused by the buildup of heat in an urban area due to a concentration of cars, buildings, and road surfaces?

ANSWER: URBAN HEAT ISLAND

BONUS

11. *GENERAL SCIENCE Short Answer* What is the name for the system of water law that gives anyone whose land adjoins a flowing stream the right to use water from a stream as long as some is left for downstream users?

ANSWER: RIPARIAN RIGHTS

TOSS-UP

12. *COMPUTER SCIENCE Short Answer* What is the symbol affixed to systems and components that denotes lower power-consumption design to encourage personal computer manufacturers to build systems that are energy efficient?

ANSWER: ENERGY STAR

BONUS

12. *COMPUTER SCIENCE Short Answer* On the Internet, what is the name for the instructions that govern the breakup of data messages into packets, the routing of the packets from sender to destination network and station, and the reassembly of the packets into the original data messages at the destination?

ANSWER: INTERNET PROTOCOL (ACCEPT: IP)

TOSS-UP

13. *PHYSICS Multiple Choice* As an object is lowered into a deep hole in the surface of the earth, which of the following must be assumed in regard to its potential energy?

- W) increase
- X) decrease
- Y) remain constant
- Z) cannot tell from the information given

ANSWER: X) DECREASE

BONUS

13. *PHYSICS Short Answer* In a 2-dimensional Cartesian coordinate system the y-component of a given vector is equal to that vector's magnitude multiplied by which trigonometric function, with respect to the angle between vector and y axis.

ANSWER: SINE

TOSS-UP

14. *BIOLOGY Multiple Choice* During meiosis, major gene reshuffling takes place as a result of crossing over in

- W) prophase I
- X) interphase
- Y) anaphase I
- Z) prophase II

ANSWER: W) PROPHASE I

BONUS

14. *BIOLOGY Short Answer* A neuron starts an action potential due to the influx of what ion?

ANSWER: SODIUM

TOSS-UP

15. *GENERAL SCIENCE Short Answer* What is the looplike bend of a river channel called?

ANSWER: MEANDER

BONUS

15. *GENERAL SCIENCE Short Answer* What is the generic term for hydroelectric power systems that use water pressure from a drop of a few hundred feet to drive a generator?

ANSWER: "LOW HEAD" HYDRO

TOSS-UP

16. *COMPUTER SCIENCE Short Answer* What is the application or suite of applications used for viewing or creating maps?

ANSWER: GEOGRAPHIC INFORMATION SYSTEMS (ACCEPT: GIS)

BONUS

16. *COMPUTER SCIENCE Multiple Choice* Which of the following is stored in the system catalogs of a DBMS?

- W) conceptual schema
- X) external schema
- Y) physical schema
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

TOSS-UP

17. *EARTH SCIENCE Multiple Choice* The Earth's core consists mainly of

- W) Oxygen
- X) Aluminum
- Y) Silicon
- Z) Iron

ANSWER: Z) IRON

BONUS

17. *CHEMISTRY Short Answer* The energy required to increase the surface area of a liquid by a given amount is known as what?

ANSWER: SURFACE TENSION

TOSS-UP

18. *GENERAL SCIENCE Multiple Choice* The names Watson & Crick are associated with;

- W) early exploration of the African continent
- X) the structure of DNA
- Y) fictional detective mysteries
- Z) the most current theory of star formation

ANSWER: X) THE STRUCTURE OF DNA

BONUS

18. *GENERAL SCIENCE Short Answer* What is the term used to describe the development of an organism from an unfertilized egg?

ANSWER: PARTHENOGENESIS

TOSS-UP

19. *ASTRONOMY Short Answer* Name the swiftest revolving planet in our solar system.

ANSWER: MERCURY

BONUS

19. *ASTRONOMY Multiple Choice* What evidence can we see today of planetesimals?

- W) the asteroid belt
- X) the Oort Cloud and Kuiper Belt
- Y) the many craters seen on the ancient surfaces of Solar System objects
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

TOSS-UP

20. *PHYSICS Short Answer* A cyclist applies an average of 100 Newton-meters of torque to the axle of the bicycle. The pedals rotate at 1 revolution per second. What is the average power in Watts produced by the cyclist?

ANSWER: 628 WATTS

BONUS

20. *PHYSICS Multiple Choice* In a 2-dimensional Cartesian system, the x-component of a vector is known, and the angle between the vector and x-axis is known. Which operation is used to calculate the magnitude of the vector (taken with respect to the x-component)?

- W) dividing by cosine
- X) dividing by sine
- Y) multiplying by cosine
- Z) multiplying by sine

ANSWER: W) DIVIDING BY COSINE

TOSS-UP

21. *BIOLOGY Short Answer* What layer of the meninges is closest to the brain?

ANSWER: PIA MATER

BONUS

21. *BIOLOGY Short Answer* Rickets is a disease caused by a deficiency of what vitamin?

ANSWER: VITAMIN D

TOSS-UP

22. *CHEMISTRY Short Answer* What is the atomic number of iodine?

ANSWER: 53

BONUS

22. *CHEMISTRY Short Answer* A stereoisomer in which substituents are located on the same side of a double bond is known as what kind of isomer?

ANSWER: CIS

TOSS-UP

23. *MATH Short Answer* One disk is selected at random from a set of nine disks numbered 1 through 9. What is the probability that the number on the selected disk is 2,3 or 4?

ANSWER: 33⅓% OR 1/3

BONUS

23. *MATH Short Answer* What is the focus and the formula for the directrix for the parabola given by the equation $y^2 = 4ax$?

ANSWER: FOCUS: $(a, 0)$ (read as: a zero) DIRECTRIX: $x = -a$

TOSS-UP

24. *ASTRONOMY Short Answer* Within one year, when were the nine rings of Uranus discovered?

ANSWER: 1977 (ACCEPT 1976-1978)

BONUS

24. *ASTRONOMY Multiple Choice* Neptune's moon Triton differs from all other large satellites in the Solar System in what way?

- W) it orbits backward compared to its planet's rotation
- X) it has an icy surface
- Y) it has enormous fissures
- Z) some of its impact craters have been modified

ANSWER: W) IT ORBITS BACKWARD COMPARED TO ITS PLANET'S ROTATION

TOSS-UP

25. *CHEMISTRY Short Answer* What family of compounds contains a carbonyl group (C=O: carbon double bond oxygen) whose carbon is attached to two other carbon atoms?

ANSWER: KETONES

BONUS

25. *CHEMISTRY Multiple Choice* Based upon position in the periodic table, the least electronegative element of this set is

W) Rubidium

X) Silver

Y) Tin

Z) Iodine

ANSWER: W) RUBIDIUM

REGIONAL ROUND 14B

TOSS-UP

1. *COMPUTER SCIENCE Multiple Choice* In terms of measures of capacity, 10^{12} bytes of data is abbreviated

- W) kilo or K
- X) tera or T
- Y) mega or M
- Z) giga or G

ANSWER: X) TERA or T

BONUS

1. *COMPUTER SCIENCE Multiple Choice* In the United States what branch of the government would use .gov to identify its Internet address?

- W) federal government agencies
- X) nonmilitary federal government agencies
- Y) state government agencies
- Z) city government agencies

ANSWER: X) NONMILITARY FEDERAL GOVERNMENT AGENCIES

TOSS-UP

2. *CHEMISTRY Short Answer* A solution with a pH of 2 has a hydrogen ion concentration that is how many times as great as a solution with a pH of 5?

ANSWER: 1000

BONUS

2. *CHEMISTRY Multiple Choice* Which of the following is the strongest acid?

- W) HClO_3
- X) HBrO_3
- Y) HIO_3
- Z) HIO_2

ANSWER: W) HClO_3

TOSS-UP

3. *EARTH SCIENCE Multiple Choice* As they move, all waves at the ocean's surface have

- W) breakers
- X) the same frequency
- Y) the same wavelength
- Z) the same general shape

ANSWER: Z) THE SAME GENERAL SHAPE

BONUS

3. *EARTH SCIENCE Short Answer* Coherent, irregularly shaped masses that form in sediments, with compositions different from the surrounding materials, are termed what?

ANSWER: CONCRETIONS

TOSS-UP

4. *COMPUTER SCIENCE Short Answer* What is the term used to describe a freestanding computer or terminal that provides information to the public, usually through a multimedia display?

ANSWER: KIOSK

BONUS

4. *COMPUTER SCIENCE Short Answer* In 1997, in a six-game match, the IBM RS/6000 SP supercomputer defeated a world champion chess player making it the first time a computer had beaten a player of his caliber. Who was the human chess player?

ANSWER: GARY KASPAROV

TOSS-UP

5. *GENERAL SCIENCE Short Answer* What is the name for widespread malnutrition and starvation in a particular area because of a shortage of food caused by catastrophic events?

ANSWER: FAMINE

BONUS

5. *GENERAL SCIENCE Short Answer* When reproductively isolated populations diverge in morphology and behavior, they are said to what?

ANSWER: SPECIATE

TOSS-UP

6. *COMPUTER SCIENCE Short Answer* What was the dimension of the now obsolete floppy disk used before 1987 and the introduction of the 3 ½ inch disk?

ANSWER: 5 ¼ INCH

BONUS

6. *COMPUTER SCIENCE Short Answer* What is the term used to describe a form of computer architecture that uses hundreds or thousands of inexpensive microprocessors to perform many operations simultaneously?

ANSWER: MASSIVELY PARALLEL

TOSS-UP

7. *GENERAL SCIENCE Multiple Choice* An example of potential energy is

- W) electricity flowing through a wire
- X) the chemical energy in a candy bar
- Y) a bullet fired at high velocity
- Z) a leaf falling from a tree

ANSWER X) THE CHEMICAL ENERGY IN A CANDY BAR

BONUS

7. *GENERAL SCIENCE Multiple Choice* The obvious relationship demonstrated by a food chain is

- W) competition
- X) predation
- Y) parasitism
- Z) commensalism

ANSWER: X) PREDATION

TOSS-UP

8. *EARTH SCIENCE Multiple Choice* The heat that produces magma is caused in part by

- W) gravity
- X) magnetic fields
- Y) radioactivity
- Z) solar energy

ANSWER: Y) RADIOACTIVITY

BONUS

8. *EARTH SCIENCE Short Answer* If the boundary between a cold air mass and a warm air mass doesn't move, what is the name given to the front that is produced between them?

ANSWER: STATIONARY FRONT

TOSS-UP

9. *CHEMISTRY Short Answer* What is the name of the isotope of hydrogen having atomic mass number 3?

ANSWER: TRITIUM

BONUS

9. *CHEMISTRY Multiple Choice* What process uses a boiling 30% sodium hydroxide solution to extract aluminum from its ore?

- W) Bayer
- X) Hall- Heroult
- Y) Dow
- Z) Frasch

ANSWER: X) HALL-HEROULT

TOSS-UP

10. *COMPUTER SCIENCE Short Answer* What is the name of the PC chip that Intel began shipping in 1993 with 3.1 million transistors on it; operating twice as fast as the best previous Intel chip?

ANSWER: PENTIUM

BONUS

10. *COMPUTER SCIENCE Multiple Choice* The digital imaging process that maps graytones in a blank-and-white image to distinct colors, producing sharper color contrasts for improved visibility is called:

- W) pseudocoloring
- X) quantizing
- Y) hue-shifting
- Z) none of the above

ANSWER: W) PSEUDOCOLORING

TOSS-UP

11. *PHYSICS Short Answer* Three 8.0 Ohm resistors are connected in parallel. What is their equivalent resistance?

ANSWER: 2.7 OHMS

BONUS

11. *PHYSICS Multiple Choice* As a gust of wind blows across a field of grain, a wave can be seen to move across the field as the tops of the plants sway back and forth. This wave is a

- W) transverse wave
- X) longitudinal wave
- Y) polarized wave
- Z) interference of waves

ANSWER: X) LONGITUDINAL WAVE

TOSS-UP

12. *EARTH SCIENCE Multiple Choice* Pure compression forces cause what general kind of fault?

- W) normal
- X) strike-slip
- Y) reverse
- Z) oblique-slip

ANSWER: Y) REVERSE

BONUS

12. *EARTH SCIENCE Multiple Choice* Carbon-14 dating is useful for determining the ages of archeological artifacts, but not of most rocks, because

- W) carbon is less abundant than silicon
- X) carbon-14 is radioactive
- Y) rocks absorb carbon dioxide from the air
- Z) the half-life of carbon-14 is too short

ANSWER: Z) THE HALF-LIFE OF CARBON-14 IS TOO SHORT

TOSS-UP

13. *COMPUTER SCIENCE Short Answer* What does the acronym SDSL mean?

ANSWER: SYMMETRIC DIGITAL SUBSCRIBER LINE

BONUS

13. *COMPUTER SCIENCE Multiple Choice* A T3 carrier can:

- W) handle 6,000 Mega bytes per second or 96 voice channels
- X) handle 12,000 Mega bytes per second or 192 voice channels
- Y) handle 24,000 Mega bytes per second or 384 voice channels
- Z) handle 44, 736 Mega bytes per second or 672 voice channels

ANSWER: Z) HANDLE 44, 736 MEGA BYTES PER SECOND OR 672 VOICE CHANNELS

TOSS-UP

14. *BIOLOGY Multiple Choice* In the human body the efficiency of the complete aerobic breakdown of a molecule of glucose is approximately

- W) 5 percent
- X) 20 percent
- Y) 40 percent
- Z) 60 percent

ANSWER: Y) 40 PERCENT

BONUS

14. *BIOLOGY Short Answer* The acceptor molecule that captures carbon dioxide during the Calvin cycle is called

ANSWER: RIBULOSE BISPHTHOSPHATE

TOSS-UP

15. *PHYSICS Multiple Choice* If a wave pulse is reflected from a free boundary, which of the following choices best describes what happens to the reflected pulse?

- W) becomes inverted
- X) remains upright
- Y) halved in amplitude
- Z) doubled in amplitude

ANSWER: X) REMAINS UPRIGHT

BONUS

15. *PHYSICS Multiple Choice* If cooking is done using an aluminum pan over an electric burner, which of the following will not promote the rate of heat flow from burner to food?

- W) increase pan bottom thickness
- X) increase pan bottom area
- Y) increase burner temperature
- Z) decrease height of pan sides

ANSWER: W) INCREASE PAN BOTTOM THICKNESS

TOSS-UP

16. *CHEMISTRY Short Answer* What sort of formal charge would you find on a nitrogen atom with two bonds and two lone pairs?

ANSWER: -1

BONUS

16. *CHEMISTRY Multiple Choice* A certain organic compound has a vapor pressure of 132 mm Hg at 54 Degrees C. To determine the vapor pressure of 2.00 moles of the compound at 37 Degrees C, taking the heat of vaporization for the compound to be 4.33×10^4 J/mole, you would use

- W) the Arrhenius equation
- X) the Clausius- Clapeyron equation
- Y) the combined gas laws
- Z) Raoult's law

ANSWER: X) THE CLAUDIUS- CLAPEYRON EQUATION

TOSS-UP

17. *PHYSICS Short Answer* How many radians are there in 360°?

ANSWER: 2 (π) (READ AS: TWO PIE)

BONUS

17. *PHYSICS Multiple Choice* If the frequency of a traveling wave train is increased by a factor of three in a medium where the velocity is constant, which of the following is the result?

- W) amplitude is one third as big
- X) amplitude is tripled
- Y) wavelength is one third as big
- Z) wavelength is tripled

ANSWER: Y) WAVELENGTH IS ONE THIRD AS BIG

TOSS-UP

18. *CHEMISTRY Multiple Choice* As an electron moves from the $n = 5$ to the $n = 3$ level

- W) a photon is emitted
- X) a photon is absorbed
- Y) energy is absorbed
- Z) the energy of the electron is increased

ANSWER: W) A PHOTON IS EMITTED

BONUS

18. *CHEMISTRY Multiple Choice* Which is the proper order of increasing electronegativity?

- W) Carbon, Oxygen, Nitrogen, Hydrogen
- X) Oxygen, Nitrogen, Carbon, Hydrogen
- Y) Nitrogen, Oxygen, Hydrogen, Carbon
- Z) Oxygen, Carbon, Nitrogen, Hydrogen

ANSWER: X) OXYGEN, NITROGEN, CARBON, HYDROGEN

TOSS-UP

19. *BIOLOGY Multiple Choice* In size, rotifers would be most comparable to which of the following?

- W) flukes
- X) nematodes
- Y) protistans
- Z) jellyfishes

ANSWER: Y) PROTISTANS

BONUS

19. *BIOLOGY Short Answer* Who was the famous 17th century Belgian scientist who contributed to the understanding of photosynthesis by growing a willow tree in 200 lbs of soil for five years?

ANSWER: JOHANN BAPTISTA VAN HELMONT (accept: VAN HELMONT)

TOSS-UP

20. *GENERAL SCIENCE Short Answer* What island in the Caribbean was devastated by volcanic eruption in 1998?

ANSWER: MONTSERRAT

BONUS

20. *GENERAL SCIENCE Short Answer* One acre equals how many square rods?

ANSWER: 160

TOSS-UP

21. *CHEMISTRY Short Answer* What element has the electron configuration: $1s^2 2s^2 2p^6 3s^2$?

ANSWER: MAGNESIUM (ACCEPT: Mg)

BONUS

21. *CHEMISTRY Multiple Choice* What product forms at the cathode during the electrolysis of molten lithium iodide?

- W) Li^+
- X) Li
- Y) I⁻
- Z) I_2

ANSWER: X) Li

TOSS-UP

22. *PHYSICS Short Answer* The two ends of a 3 Ohm resistor are connected to a 9 V battery. What is the total power (in watts) delivered by the battery to the circuit?

ANSWER: 27.0 W

BONUS

22. *PHYSICS Multiple Choice* Active solar heating involves the use of

- W) convection currents
- X) air locks
- Y) pumps
- Z) the greenhouse effect

ANSWER: Y) PUMPS

TOSS-UP

23. *GENERAL SCIENCE Short Answer* What is the name for a body of water which separates an island from the mainland?

ANSWER: SOUND

BONUS

23. *GENERAL SCIENCE Short Answer* What is the name for a coral reef that partially or completely surrounds a lagoon?

ANSWER: ATOLL

TOSS-UP

24. *COMPUTER SCIENCE Short Answer* What is the term used to describe a program associated with UNIX systems that performs a housekeeping or maintenance utility function without being caused by the user?

ANSWER: DAEMON

BONUS

24. *COMPUTER SCIENCE Short Answer* A network organization in which all of the nodes are connected to and communicate through a single point or hub has what type of topology?

ANSWER: STAR

TOSS-UP

25. *BIOLOGY Short Answer* Fibrinogen becomes fibrin in the presence of what enzyme?

ANSWER: THROMBIN

BONUS

25. *BIOLOGY Multiple Choice* Urokinase is an enzyme which can be used to

- W) dissolve clots
- X) replace white blood cells
- Y) transfuse blood
- Z) treat wounds

ANSWER: W) DISSOLVE CLOTS

REGIONAL ROUND 15B

TOSS-UP

1. *ASTRONOMY Multiple Choice* We don't get eclipses every month. This is because

- W) the Earth's rotation axis is tilted with respect to its orbit
- X) the Moon's orbit is tilted with respect to the Earth's orbit
- Y) the Earth's orbit is elliptical
- Z) the Moon's orbit is elliptical

ANSWER: X) THE MOON'S ORBIT IS TILTED WITH RESPECT TO THE EARTH'S ORBIT

BONUS

1. *ASTRONOMY Multiple Choice* An astronomer finds that the spectrum of a mysterious object shows bright emission lines. What can she conclude about the source?

- W) it contains cold gas
- X) it is an incandescent solid body
- Y) it contains hot, relatively tenuous gas
- Z) it is moving toward Earth at high speed

ANSWER: Y) IT CONTAINS HOT, RELATIVELY TENUOUS GAS

TOSS-UP

2. *GENERAL SCIENCE Short Answer* What is the term for the instant or the day that the earth is farthest away from the sun?

ANSWER: APOGEE

BONUS

2. *GENERAL SCIENCE Short Answer* What is the term for the transitional zone in which one type of ecosystem tends to merge with another ecosystem?

ANSWER: ECOTONE

TOSS-UP

3. *EARTH SCIENCE Multiple Choice* What forms when streams enter bodies of standing water, undergo an abrupt loss of velocity, and drop their load of sediment?

- W) alluvial fans
- X) meanders
- Y) falls
- Z) deltas

ANSWER: Z) DELTAS

BONUS

3. *EARTH SCIENCE Multiple Choice* The accumulation of clay minerals is the greatest in which of the following horizons of the soil profile?

- W) A
- X) B
- Y) C
- Z) D

ANSWER: X) B

TOSS-UP

4. *ASTRONOMY Multiple Choice* For what type of object is the period-luminosity relation used for determining distances?

- W) RR Lyrae variables (pron: lea-ray)
- X) Cepheids
- Y) Cataclysmic variables
- Z) 21 centimeter radiation

ANSWER: X) CEPHEIDS

BONUS

4. *ASTRONOMY Multiple Choice* During spring tide

- W) the tidal range is unusually small
- X) the tidal range is average
- Y) the tidal range is unusually large
- Z) tides happen more frequently

ANSWER: Y) THE TIDAL RANGE IS UNUSUALLY LARGE

TOSS-UP

5. *GENERAL SCIENCE Short Answer* What is the term for soil or other material which can pass through a 75 micron sieve?

ANSWER: FINES

BONUS

5. *GENERAL SCIENCE Short Answer* Farmers that grow only enough food to feed their families are termed what kind of farmers?

ANSWER: SUBSISTENCE

TOSS-UP

6. *MATH Multiple Choice* If the first derivative of a function f at c equals 0 and the second derivative at c is greater than zero, then f has a

- W) local maximum at $x = c$
- X) local maximum at $x = -c$
- Y) local minimum at $x = c$
- Z) local minimum at $x = -c$

ANSWER: Y) LOCAL MINIMUM AT $x = c$

BONUS

6. *MATH Multiple Choice* Find the distance between the two points (0,7) (read as: zero comma seven) and (3,3) (read as: three comma three)

- W) 4
- X) square root of 5
- Y) 3
- Z) 5

ANSWER: Z) 5

TOSS-UP

7. *COMPUTER SCIENCE Short Answer* What is the area on the display screen in a Windows or Macintosh application used for accessing a number of single-mouse-click commands?

ANSWER: TOOLBAR

BONUS

7. *COMPUTER SCIENCE Short Answer* What is the name for a serial bus that has a bandwidth of 1.5 Mega bytes per second and is used for connecting multiple peripherals to a microcomputer?

ANSWER: USB OR UNIVERSAL SERIAL BUS

TOSS-UP

8. *GENERAL SCIENCE Multiple Choice* Gasohol is gasoline mixed with

- W) ethanol
- X) methane
- Y) methanol
- Z) butane

ANSWER: W) ETHANOL

BONUS

8. *GENERAL SCIENCE Short Answer* What is the term for a volcanic crater several miles in diameter?

ANSWER: CALDERA

TOSS-UP

9. *MATH Short Answer* Evaluate $\sum_{i=1}^{100} 1 = ?$ (read as: summation from i equals 1 to 100 of the quantity "one" equals)

ANSWER: 100

BONUS

9. *MATH Short Answer* Suppose $f(x) = (x^4 + x + 7)^{100}$, (read as: F of X equals the quantity X to the fourth plus X plus 7 end quantity to the 100th power) what is df/dx ? (read as: D F D X)

ANSWER: $100(x^4 + x + 7)^{99}(4x^3 + 1)$

TOSS-UP

10. *ASTRONOMY Multiple Choice* There is little or no interstellar dust or gas in which of the following galaxy types?

- W) spirals
- X) ellipticals
- Y) barred spirals
- Z) irregulars

ANSWER: X) ELLIPTICALS

BONUS

10. *ASTRONOMY Multiple Choice* Which kind of photon has the highest energy?

- W) Ultraviolet
- X) Visible
- Y) X-Ray
- Z) Infrared

ANSWER: Y) X-RAY

TOSS-UP

11. *GENERAL SCIENCE Multiple Choice* The human population of Ireland experienced a major crash as a result of

- W) the plague
- X) the potato fungus
- Y) an influenza epidemic
- Z) a prolonged drought

ANSWER: X) THE POTATO FUNGUS

BONUS

11. *GENERAL SCIENCE Short Answer* What do materials lose when the surrounding temperature exceeds the "Curie point"?

ANSWER: MAGNETISM

TOSS-UP

12. *MATH Short Answer* Using radians as the unit of angle measurement, what is the number of radians in an arbitrary angle θ placed at the center of a circle with radius r subtending an arc of length s ?

ANSWER: s/r

BONUS

12. *MATH Multiple Choice* The critical points of $f(x) = \sqrt{x^2 + 1}$ are: (read as: f of x equals the square root of the quantity x squared plus 1)

- W) 1 and - 1
- X) 1 and 0
- Y) 0
- Z) the function has no critical points

ANSWER: Y) 0

TOSS-UP

13. *CHEMISTRY Short Answer* When subjected to the flame test, a solution that contains Potassium+ ions will produce what color?

ANSWER: VIOLET (ACCEPT: PURPLE)

BONUS

13. *CHEMISTRY Multiple Choice* The most active metals are usually reduced by

- W) electrolysis
- X) roasting sulfide ores in air
- Y) reaction with carbon or hydrogen
- Z) None of these statements is true

ANSWER: W) ELECTROLYSIS

TOSS-UP

14. *BIOLOGY Multiple Choice* The human body contains about how many different amino acids?

- W) 3
- X) 10
- Y) 12
- Z) 20

ANSWER: Z) 20

BONUS

14. *BIOLOGY Multiple Choice* Hominids are characterized as being

- W) insectivores
- X) herbivores
- Y) carnivores
- Z) omnivores

ANSWER: Z) OMNIVORES

TOSS-UP

15. *COMPUTER SCIENCE Short Answer*
What does the acronym DVD mean?

ANSWER: DIGITAL VERSATILE DISC

BONUS

15. *COMPUTER SCIENCE Multiple Choice* The binary number 00101010 represents the character

- W) / (read as: forward slash)
- X) & (read as: ampersand)
- Y) – (read as: minus sign)
- Z) + (read as: plus sign)

ANSWER: Z) + (READ AS: PLUS SIGN)

TOSS-UP

16. *GENERAL SCIENCE Short Answer* What is the name for plants that use their roots to attach themselves to branches high in trees?

ANSWER: EPIPHYTES

BONUS

16. *GENERAL SCIENCE Short Answer* What is the name for the condition where a cold front overtakes a warm front and the denser cold air flows under the less dense warm air?

ANSWER: OCCLUDED FRONT

TOSS-UP

17. *BIOLOGY Multiple Choice* Prokaryotic cells do NOT have

- W) ribosomes
- X) membrane-bound nuclei
- Y) cytoplasm
- Z) a plasma membrane

ANSWER: X) MEMBRANE-BOUND NUCLEI

BONUS

17. *BIOLOGY Short Answer* If the cardiac output is 4800 milliliters per minute, and the heart rate is 60 beats per minute, what is the stroke volume?

ANSWER: 80 MILLILITERS/ BEAT

TOSS-UP

18. *CHEMISTRY Short Answer* Structural isomers that easily interconvert are called

ANSWER: TAUTOMERS

BONUS

18. *CHEMISTRY Multiple Choice* The form of spontaneous radioactive decay in which the atomic number increases is

- W) beta decay
- X) positron decay
- Y) fusion
- Z) electron capture

ANSWER: W) BETA DECAY

TOSS-UP

19. *BIOLOGY Short Answer* The body's first line of defense against potentially harmful organisms is what organ?

ANSWER: SKIN

BONUS

19. *BIOLOGY Multiple Choice* Green algae are similar to land plants in all but which of the following characteristics?

- W) types and proportions of photosynthetic pigments
- X) storage of carbohydrate in the form of starch
- Y) cell walls composed of cellulose
- Z) haploid dominant life cycles

ANSWER: Z) HAPLOID DOMINANT LIFE CYCLES

TOSS-UP

20. *EARTH SCIENCE Short Answer* Humans first appeared during which Period of geologic time?

ANSWER: QUATERNARY (ACCEPT: NEOGENE)

BONUS

20. *EARTH SCIENCE Multiple Choice* The minerals found in the B and C horizons were dissolved and carried down to those soil layers by what process?

- W) oxidation
- X) leaching
- Y) disintegration
- Z) precipitation

ANSWER: X) LEACHING

TOSS-UP

21. *GENERAL SCIENCE Short Answer* Furniture stuffing, paneling, particle board, and foam insulation may be sources of which dangerous indoor air pollutant?

ANSWER: FORMALDEHYDE

BONUS

21. *GENERAL SCIENCE Multiple Choice* The greatest threat to human health generally comes from radioisotopes with

- W) short half-lives
- X) intermediate half-lives
- Y) long half-lives
- Z) none of the above

ANSWER: X) INTERMEDIATE HALF-LIVES

TOSS-UP

22. *CHEMISTRY Short Answer* What is the bond angle of a trigonal planar arrangement of electrons in degrees?

ANSWER: 120

BONUS

22. *CHEMISTRY Short Answer* The escape of gas through a small hole in a container is known as

ANSWER: EFFUSION

TOSS-UP

23. *GENERAL SCIENCE Short Answer* Under whose presidency in 1905 was the first wildlife refuge opened and the US Forest Service established?

ANSWER: THEODORE ROOSEVELT

BONUS

23. *GENERAL SCIENCE Short Answer* What is the term used for the movement of particles obliquely up and down the slope of a beach?

ANSWER: BEACH DRIFT

TOSS-UP

24. *MATH Short Answer* Let $f(x) = (\sin x)^2$. (read as: F of X equals open parenthesis sine X end parenthesis to the second power) What is $f'(x)$? (read: f prime of x)

ANSWER: $2 \sin x \cos x$ (read: two sine x cosine x)

BONUS

24. *MATH Multiple Choice* In applying calculus to economics problems of manufacturing costs and revenues, the maximum profit occurs when

- W) marginal revenue equals marginal cost
- X) marginal revenue is greater than marginal cost
- Y) marginal revenue is less than marginal cost
- Z) none of the above

ANSWER: W) MARGINAL REVENUE EQUALS MARGINAL COST

TOSS-UP

25. *BIOLOGY Short Answer* In the cell, the nucleotide most closely associated with energy transfer in the cell is

ANSWER: ATP

BONUS

25. *BIOLOGY Short Answer* In plants, what hormone controls the rate of transpiration?

ANSWER: ABSCISIC ACID

REGIONAL ROUND 16B

TOSS-UP

1. *COMPUTER SCIENCE Multiple Choice* Which of the following is also a UNIX operating system?

- W) AIX
- X) A/UX (read as: A forward slash U X)
- Y) Mach
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

1. *COMPUTER SCIENCE Short Answer* What is the term used to describe an executable program file that contains one or more compressed text or data files?

ANSWER: SELF-EXTRACTING FILE

TOSS-UP

2. *EARTH SCIENCE Short Answer* What is a wide, flat area of small-grained sediments found on either side of a river called?

ANSWER: FLOOD PLAIN

BONUS

2. *EARTH SCIENCE Multiple Choice* Which of the following rock types is most likely to be composed of shells?

- W) shale
- X) anhydrite
- Y) sandstone
- Z) limestone

ANSWER: Z) LIMESTONE

TOSS-UP

3. *PHYSICS Short Answer* An electrical circuit in which the voltage across every circuit element must be the same is called what kind of circuit?

ANSWER: PARALLEL

BONUS

3. *PHYSICS Multiple Choice* If an ideal gas does positive work on its surroundings, we may assume, with regard to the gas; its:

- W) temperature increases
- X) volume increases
- Y) pressure increases
- Z) internal energy decreases

ANSWER: X) VOLUME INCREASES

TOSS-UP

4. *CHEMISTRY Short Answer* The isotope that is the starting point in natural radioactive decay is known as what kind of isotope?

ANSWER: PARENT

BONUS

4. *CHEMISTRY Short Answer* What rule states that the major product in the formation of alkenes by elimination reactions will be the more highly substituted alkene?

ANSWER: THE ZAITSEV RULE

TOSS-UP

5. *BIOLOGY Multiple Choice* Which of the following statements is FALSE?

- W) shark's teeth are modified scales that are continuously shed and replaced.
- X) many fish use a swim bladder to provide buoyancy control.
- Y) the bony fishes were the ancestors of the cartilaginous fishes.
- Z) the ray-finned fishes are the most numerous and diverse of the fish groups.

ANSWER: Y) THE BONY FISHES WERE THE ANCESTORS OF THE CARTILAGINOUS FISHES

BONUS

5. *BIOLOGY Multiple Choice* Which of the following bacteria are the least related to the others?

- W) archaeobacteria
- X) extreme halophiles
- Y) chemosynthetic eubacteria
- Z) extreme thermophiles

ANSWER: Y) CHEMOSYNTHETIC EUBACTERIA

TOSS-UP

6. *MATH Multiple Choice* A simple and effective procedure for encoding and decoding messages uses matrices, where the decoding matrix is

- W) the inverse of the encoding matrix
- X) the identity matrix
- Y) a square matrix with the top row of all one's
- Z) none of the above

ANSWER: W) THE INVERSE OF THE ENCODING MATRIX

BONUS

6. *MATH Short Answer* A matrix that does not have an inverse is often referred to as a

ANSWER: SINGULAR MATRIX

TOSS-UP

7. *GENERAL SCIENCE Short Answer* All organic compounds are characterized by the presence of what element?

ANSWER: CARBON

BONUS

7. *GENERAL SCIENCE Short Answer* In 1985, scientists discovered a carbon molecule containing 60 carbon atoms arranged in a geodesic sphere. What is the nickname for this molecule?

ANSWER: BUCKY BALL

TOSS-UP

8. *CHEMISTRY Short Answer* The reactant that determines the amount of product that can be formed in a reaction is termed what reagent?

ANSWER: LIMITING

BONUS

8. *CHEMISTRY Multiple Choice* The functional group in the compound $\text{CH}_3\text{CH}_2\text{CHBrCH}_3$ is

- W) methyl-
- X) bromo-
- Y) ethyl-
- Z) butane

ANSWER: X) BROMO-

TOSS-UP

9. *EARTH SCIENCE Multiple Choice* What are two diseases that can be caused by germs in drinking water?

- W) typhoid and chlorine
- X) chlorine and smallpox
- Y) typhoid and cholera
- Z) cholera and fluoride

ANSWER: Y) TYPHOID AND CHOLERA

BONUS

9. *EARTH SCIENCE Multiple Choice* As an object moves from the mesosphere to the stratosphere, the amount of air pressure exerted on the object

- W) decreases
- X) remains the same
- Y) increases
- Z) increases and then decreases

ANSWER: Y) INCREASES

TOSS-UP

10. *BIOLOGY Short Answer* In plants, the hormones most closely associated with cell division are called what?

ANSWER: CYTOKININS

BONUS

10. *BIOLOGY Multiple Choice* The cell wall

- W) provides skeletal support for plants
- X) controls what enters and leaves a cell
- Y) functions as the plasma membrane in plant cells
- Z) is found in all eukaryotes

ANSWER: W) PROVIDES SKELETAL SUPPORT FOR PLANTS

TOSS-UP

11. *ASTRONOMY Multiple Choice* If a planet had its rotation axis perpendicular to its orbital plan (no tilt), its seasons would be

- W) shorter than those on Earth
- X) longer than those on Earth
- Y) the same as those on Earth
- Z) constant

ANSWER: Z) CONSTANT

BONUS

11. *ASTRONOMY Multiple Choice* If an object's spectral lines are shifted to longer wavelengths, the object is

- W) moving away from us
- X) moving toward us
- Y) very hot
- Z) very cold

ANSWER: W) MOVING AWAY FROM US

TOSS-UP

12. *PHYSICS Multiple Choice* The unit of electric resistance, the ohm, is dimensionally equivalent to which of the following?

- W) Volt/Amp (Volt per amp)
- X) Volt meter
- Y) Amp/Sec (Amp per second)
- Z) Amp meter

ANSWER: W) VOLT PER AMP

BONUS

12. *PHYSICS Short Answer* A 4 mole ideal gas system undergoes an adiabatic process where it expands and does 20 Joules of work on its environment. How much heat is received by the system?

ANSWER: ZERO

TOSS-UP

13. *ASTRONOMY Multiple Choice* A cloud of gases around the solid portion of a comet is known as the

- W) coma
- X) core
- Y) heart
- Z) nucleus

ANSWER: W) COMA

BONUS

13. *ASTRONOMY Multiple Choice* What physical property of a star does the spectral type measure?

- W) luminosity
- X) temperature
- Y) mass
- Z) composition

ANSWER: X) TEMPERATURE

TOSS-UP

14. *PHYSICS Multiple Choice* Which is not a force?

- W) gravity
- X) electrical force
- Y) electromotive force
- Z) friction

ANSWER: Y) ELECTROMOTIVE FORCE

BONUS

14. *PHYSICS Multiple Choice* When a magnetic field causes a charged particle to move in a circular path, the only quantity listed below which the magnetic force changes significantly as the particle goes around in a circle is the particle's

- W) energy
- X) momentum
- Y) radius for the circle
- Z) time to go around the circle once

ANSWER: X) MOMENTUM

TOSS-UP

15. *CHEMISTRY Short Answer* What is the oxidation number of oxygen when it is not in a peroxide?

ANSWER: -2

BONUS

15. *CHEMISTRY Short Answer* What element has the electron configuration: $1s^22s^22p^63s^1$?

ANSWER: SODIUM (ACCEPT: Na)

TOSS-UP

16. *ASTRONOMY Multiple Choice* The following planets are considered "sister" planets:

- W) Mercury and Mars
- X) Neptune and Jupiter
- Y) Uranus and Saturn
- Z) Earth and Venus

ANSWER: Z) EARTH AND VENUS

BONUS

16. *ASTRONOMY Multiple Choice* A ground-based telescope to observe x-rays would

- W) be a powerful tool for studying abnormally cold stars or distant planets
- X) give astronomers the chance to study the insides of stars and planets
- Y) be worthless because x-rays cannot get through the Earth's atmosphere
- Z) be worthless because astronomers have not yet devised detectors for x-rays

ANSWER: Y) BE WORTHLESS BECAUSE X-RAYS CANNOT GET THROUGH THE EARTH'S ATMOSPHERE

TOSS-UP

17. *CHEMISTRY Short Answer* Name the cycloaddition reaction between a conjugated diene and an alkene that produces a 1,4-addition product.

ANSWER: DIELS-ALDER

BONUS

17. *CHEMISTRY Multiple Choice* Calcium oxide will react with carbon dioxide to form calcium carbonate. Which species acts as a Lewis acid in the reaction?

- W) Ca^{2+} (read as: Calcium two-plus)
- X) O^{2-} (read as: Oxygen two minus)
- Y) CO_2 (read as: Carbon Dioxide)
- Z) CaCO_3 (read as: Calcium Carbonate)

ANSWER: Y) CO_2

TOSS-UP

18. *MATH Multiple Choice* If $f(x) = x + 1 - 5/x$, (read as: f of x equals x plus 1 minus five over x) then $f'(x)$ equals (read as: the first derivative of F of X)

- W) $1 - 5/x$
- X) $x + 5/x^2$
- Y) $1 - 5/x^2$
- Z) $1 + 5/x^2$

ANSWER: Z) $1 + 5/x^2$

BONUS

18. *MATH Multiple Choice* The area bounded by $\sin x$ and x -axis over $[0, 2\pi]$ is (read as: the closed interval zero comma two pie)

- W) 1
- X) 2
- Y) 4
- Z) 2π

ANSWER: Y) 4

TOSS-UP

19. *ASTRONOMY Multiple Choice* If an object moves along a curved path at a constant speed, you can infer that

- W) a force is acting on it
- X) it is accelerating
- Y) it is in uniform motion
- Z) both W and X are true

ANSWER: Z) BOTH W AND X ARE TRUE

BONUS

19. *ASTRONOMY Multiple Choice* The spoke-like features observed in the rings of Saturn are caused by

- W) holes in the rings-places where no ring material exists
- X) charged dust particles suspended by the magnetic field of the planet
- Y) dust particles within the ring
- Z) carbon dioxide molecules that absorb light incident upon the gas

ANSWER: X) CHARGED DUST PARTICLES SUSPENDED BY THE MAGNETIC FIELD OF THE PLANET

TOSS-UP

20. *COMPUTER SCIENCE Short Answer* What is the file extension that identifies a vector image encoded as a Windows metafile?

ANSWER: .WMF (READ AS: DOT W M F)

BONUS

20. *COMPUTER SCIENCE Short Answer* In an image, the term that expresses the number of horizontal pixels divided by the number of vertical pixels is called what

ANSWER: ASPECT RATIO

TOSS-UP

21. *BIOLOGY Short Answer* Who was the German botanist who first proposed that all plants consist of cells?

ANSWER: MATTHIAS SCHLEIDEN (ACCEPT: SCHLEIDEN)

BONUS

21. *BIOLOGY Multiple Choice* Which is NOT true of a plant hormone called gibberellin.

- W) breaks dormancy in seeds in buds
- X) first isolated from a fungus
- Y) causes stem elongation
- Z) triggers flower production

ANSWER: Z) TRIGGERS FLOWER PRODUCTION

TOSS-UP

22. *CHEMISTRY Short Answer* What type of chemical bond would you expect between a silicon atom and an oxygen atom?

ANSWER: POLAR COVALENT (ACCEPT: COVALENT)

BONUS

22. *CHEMISTRY Multiple Choice* A form of spontaneous radioactive decay in which the n/p ratio decreases is

- W) electron capture
- X) fusion
- Y) positron emission
- Z) beta decay

ANSWER: Z) BETA DECAY

TOSS-UP

23. *GENERAL SCIENCE Short Answer* What is the name for a cluster of islands such as the Galapagos?

ANSWER: ARCHIPELAGO

BONUS

23. *GENERAL SCIENCE Short Answer* The United States has already lost about what fraction of the original topsoil of the cropland in use today?

ANSWER: ONE-THIRD

TOSS-UP

24. *EARTH SCIENCE Short Answer* Older fragments enclosed within younger rock masses are called

ANSWER: INCLUSIONS (ACCEPT: XENOLITHS)

BONUS

24. *EARTH SCIENCE Multiple Choice* A cone of depression on the water table is caused by

- W) the jet flow of a waterfall
- X) an increase in groundwater recharge
- Y) pumping from a well
- Z) ice melting in an outwash plain

ANSWER: Y) PUMPING FROM A WELL

TOSS-UP

25. *CHEMISTRY Short Answer* Which state of matter is characterized by having an indefinite shape, but a definite volume?

ANSWER: LIQUID

BONUS

25. *CHEMISTRY Short Answer* What term describes the difference in energy between the two sets of orbitals that result from considering the approach of six point charges toward the central metal atom?

ANSWER: CRYSTAL FIELD SPLITTING ENERGY

REGIONAL ROUND 17B

TOSS-UP

1. *PHYSICS Multiple Choice* What is the phase difference when two waves, traveling in the same medium, that undergo constructive interference?

- W) 270 degrees
- X) 180 degrees
- Y) 90 degrees
- Z) zero degrees

ANSWER: Z) ZERO DEGREES

BONUS

1. *PHYSICS Short Answer* Name all four states of matter

ANSWER: SOLID, LIQUID, GAS, PLASMA

TOSS-UP

2. *ASTRONOMY Multiple Choice* The one terrestrial planet which rotates in the "wrong" way, meaning opposite to the other planet's spin direction, is

- W) Venus
- X) Mercury
- Y) Earth
- Z) Mars

ANSWER: W) VENUS

BONUS

2. *ASTRONOMY Multiple Choice* Neptune was the last planet to be visited by which space probe?

- W) Voyager I
- X) Galileo
- Y) Voyager II
- Z) Magellan

ANSWER: Y) VOYAGER II

TOSS-UP

3. *PHYSICS Multiple Choice* Jeff throws a ball straight up. For which situation is the vertical velocity zero?

- W) on the way up
- X) at the top
- Y) on the way back down
- Z) none of the above

ANSWER: X) AT THE TOP

BONUS

3. *PHYSICS Multiple Choice* An object is attached to a spring and its frequency of oscillation is measured. Another object is connected to the first object, and the resulting mass is four times the original value. By what factor is the frequency of oscillation changed?

- W) 1/4
- X) 1/2
- Y) 1/16
- Z) 4

ANSWER: X) 1/2

TOSS-UP

4. *BIOLOGY Multiple Choice* Cholesterol is a(n)

- W) amino acid
- X) fatty acid
- Y) polysaccharide
- Z) steroid

ANSWER: Z) STEROID

BONUS

4. *BIOLOGY Multiple Choice* Which of the following animal groups does NOT have tissues?

- W) nematodes
- X) sponges
- Y) echinoderms
- Z) flatworms

ANSWER: X) SPONGES

TOSS-UP

5. *CHEMISTRY Multiple Choice* The most common isotope of hydrogen has

- W) 1 neutron and 1 electron
- X) 1 proton and 1 electron
- Y) 1 proton, 1 neutron, and 1 electron
- Z) 2 protons and 2 electrons

ANSWER: X) 1 PROTON AND 1 ELECTRON

BONUS

5. *CHEMISTRY Multiple Choice* Nuclear binding energies per nucleon are at a maximum around what element?

- W) protium
- X) deuterium
- Y) iron
- Z) uranium

ANSWER: Y) IRON

TOSS-UP

6. *ASTRONOMY Multiple Choice* At very high energies and temperatures, the four fundamental forces become

- W) divided into 7 forces
- X) unified
- Y) one dimensional
- Z) divided into 11 forces

ANSWER: X) UNIFIED

BONUS

6. *ASTRONOMY Multiple Choice* Which type of electromagnetic radiation has the longest wavelength?

- W) Visible
- X) X-ray
- Y) Infrared
- Z) Radio

ANSWER: Z) RADIO

TOSS-UP

7. *BIOLOGY Short Answer* Saturated fatty acids contain more covalently bonded atoms of this element than unsaturated fats.

ANSWER: HYDROGEN

BONUS

7. *BIOLOGY Short Answer* In mammals, water accumulation in the tissues is technically called

ANSWER: EDEMA

TOSS-UP

8. *CHEMISTRY Multiple Choice* Pure aluminum is not used in the fabrication of road signs because pure aluminum is

W) heavier than alloyed aluminum

X) too expensive to make

Y) too soft to be durable

Z) soluble in water

ANSWER: Y) TOO SOFT TO BE DURABLE

BONUS

8. *CHEMISTRY Short Answer* What is the order in which electrons fill atomic orbitals according to energy factors called?

ANSWER: AUFBAU BUILDUP

TOSS-UP

9. *PHYSICS Multiple Choice* Which of the following demonstrate the property of inertia?

- W) a car skidding on a slippery road
- X) a brick sitting on a table top
- Y) whipping a tablecloth out from under the dishes set on a table
- Z) all of the above

ANSWER: Z) ALL OF THE ABOVE

BONUS

9. *PHYSICS Short Answer* The specific nuclear fusion reaction involving Hydrogen which produces energy in the Sun is called what?

ANSWER: PROTON-PROTON CHAIN (ACCEPT: P-P CHAIN)

TOSS-UP

10. *BIOLOGY Short Answer* Large, round cells distributed throughout the body that are filled with small vesicles containing histamine are called

ANSWER: MAST CELLS

BONUS

10. *BIOLOGY Short Answer* The cellular organelle that is compared to a whip and used in locomotion is a

ANSWER: FLAGELLUM

TOSS-UP

11. *GENERAL SCIENCE Multiple Choice* The system responsible for growth, reproductive development, and much of our behavior is the

- W) circulatory system
- X) endocrine system
- Y) immune system
- Z) digestive system

ANSWER: X) ENDOCRINE SYSTEM

BONUS

11. *GENERAL SCIENCE Short Answer* What is the name for the molecules released by cells in damaged tissue that dilates capillaries and increases their tendency to leak fluid, such as associated with allergies and poison ivy?

ANSWER: HISTAMINES

TOSS-UP

12. *BIOLOGY Short Answer* The method of movement of molecules across a cell membrane that requires the expenditure of ATP molecules is called

ANSWER: ACTIVE TRANSPORT

BONUS

12. *BIOLOGY Short Answer* Desert- adapted plants, such as cacti, use a modified carbon pathway in photosynthesis called what?

ANSWER: CAM PATHWAY (CAM)

TOSS-UP

13. *EARTH SCIENCE Multiple Choice* Which of the following is an example of a biodegradable object?

- W) aluminum can
- X) glass bottle
- Y) plastic bottle
- Z) paper bag

ANSWER: Z) PAPER BAG

BONUS

13. *EARTH SCIENCE Multiple Choice* Which type of volcano is associated with violent eruptions?

- W) shield
- X) fissure
- Y) oceanic ridge
- Z) composite cone

ANSWER: Z) COMPOSITE CONE

TOSS-UP

14. *CHEMISTRY Short Answer* What is the proper ratio of Lithium to Bromine?

ANSWER: 1:1 (READ: ONE TO ONE)

BONUS

14. *CHEMISTRY Short Answer* What is the name of FeBr₂.

ANSWER: IRON (II) BROMIDE (READ AS: IRON TWO BROMIDE)

TOSS-UP

15. *GENERAL SCIENCE Short Answer* What is the term for one full cycle of the phases of the moon, equal to 29.5 days?

ANSWER: LUNATION

BONUS

15. *GENERAL SCIENCE Short Answer* What is the scientific name for the study of animal behavior?

ANSWER: ETHOLOGY

TOSS-UP

16. *BIOLOGY Short Answer* Different, or alternative, forms of the same gene are called

ANSWER: ALLELES

BONUS

16. *BIOLOGY Short Answer* Plant tissue involved in regeneration following a wound to the plant is called

ANSWER: PARENCHYMA

TOSS-UP

17. *CHEMISTRY Multiple Choice* The detailed molecular-level picture of how a reaction might take place

- W) is the reaction mechanism
- X) is the transition state
- Y) is the reaction coordinate
- Z) is the activation energy

ANSWER: W) IS THE REACTION MECHANISM

BONUS

17. *CHEMISTRY Short Answer* Rank alpha radiation, beta radiation, and neutrons in terms of decreasing damage produced in tissue

ANSWER: ALPHA RADIATION, NEUTRONS, BETA RADIATION

TOSS-UP

18. *COMPUTER SCIENCE Short Answer* In the 1968 Stanley Kubrick's film 2001:A Space Odyssey, what was the name of the supercomputer?

ANSWER: HAL

BONUS

18. *COMPUTER SCIENCE Short Answer* What does the acronym TIFF mean?

ANSWER: TAGGED (OR TAG) IMAGE FILE FORMAT

TOSS-UP

19. *BIOLOGY Multiple Choice* Dietary or plant fiber is a nondigestible

- W) monosaccharide
- X) nucleic acid
- Y) polysaccharide
- Z) protein

ANSWER: Y) POLYSACCHARIDE

BONUS

19. *BIOLOGY Multiple Choice* A person with type B blood can receive which blood type(s) safely?

- W) A only
- X) B only
- Y) A and O
- Z) B and O

ANSWER: Z) B AND O

TOSS-UP

20. *EARTH SCIENCE Short Answer* What term refers to the part of the earth in which life exists?

ANSWER: BIOSPHERE

BONUS

20. *EARTH SCIENCE Multiple Choice* The layer of the atmosphere that is the coldest of all the layers is the

- W) exosphere
- X) thermosphere
- Y) mesosphere
- Z) troposphere

ANSWER: Y) MESOSPHERE

TOSS-UP

21. *BIOLOGY Short Answer* After pyruvate arrives in the mitochondrion, it is oxidized through a series of steps to a two- carbon compound called

ANSWER: ACETYL-COA

BONUS

21. *BIOLOGY Multiple Choice* Golgi tendon organs are

- W) chemoreceptors
- X) mechanoreceptors
- Y) pain receptors
- Z) position receptors

ANSWER: X) MECHANORECEPTORS

TOSS-UP

22. *CHEMISTRY Short Answer* How many covalent bonds can oxygen form?

ANSWER: TWO

BONUS

22. *CHEMISTRY Multiple Choice* The largest difference between successive ionization energies for Boron is between the

- W) 1st and 2nd ionization energies
- X) 2nd and 3rd ionization energies
- Y) 3rd and 4th ionization energies
- Z) 4th and 5th ionization energies

ANSWER: Y) 3RD AND 4TH IONIZATION ENERGIES

TOSS-UP

23. *BIOLOGY Short Answer* In plants, the primary carbohydrate used in the transport of food from the leaves to the root is

ANSWER: SUCROSE

BONUS

23. *BIOLOGY Multiple Choice* The least inclusive of the taxonomic categories listed here is

- W) family
- X) phylum
- Y) class
- Z) genus

ANSWER: Z) GENUS

TOSS-UP

24. *COMPUTER SCIENCE Short Answer* What term is used to describe the science that seeks to explain intelligence by deriving and testing models of how humans reason, perceive and understand?

ANSWER: COGNITIVE SCIENCE

BONUS

24. *COMPUTER SCIENCE Short Answer* Who reinvented the punched card as a means for storing numerical information, which was used for processing the 1890 US census?

ANSWER: HERMAN HOLLERITH (ACCEPT: HOLLERITH)

TOSS-UP

25. *EARTH SCIENCE Short Answer* What kind of desalination of seawater involves electrically charged particles?

ANSWER: ELECTRODIALYSIS (ACCEPT: ELECTROLYSIS)

BONUS

25. *EARTH SCIENCE Multiple Choice* A tributary flowing parallel to the mainstream due to the presence of a natural levee is a

- W) tombigbee
- X) yazoo
- Y) antecedent
- Z) distributary

ANSWER: X) YAZOO

REGIONAL B TIEBREAKERS

1. *BIOLOGY Short Answer* What is the name for a specialized disk-shaped structure on the chromatids that attaches the mitotic spindle to the centromere?

ANSWER: KINETOCHORE

2. *CHEMISTRY Short Answer* At what temperature Celsius does the motion of particles cease?

ANSWER: -273 DEGREES CELSIUS

3. *GENERAL SCIENCE Short Answer* What is the name for an area that contains saturated soil and organic material all year, but has little or no standing water?

ANSWER: BOG

4. *ASTRONOMY Multiple Choice* The magnetic fields of Neptune and Uranus differ from other planets because

- W) they are both much weaker
- X) they are tilted far off of the rotation axis
- Y) they are both much stronger
- Z) They oscillate on and off

ANSWER: X) THEY ARE TILTED FAR OFF OF THE ROTATION AXIS

5. *GENERAL SCIENCE Multiple Choice* The system responsible for growth, reproductive development, and much of our behavior is the

- W) circulatory system
- X) endocrine system
- Y) immune system
- Z) digestive system

ANSWER: X) ENDOCRINE SYSTEM

1. *GENERAL Short Answer* What is the weather term for a low that is long, rather than nearly circular?

ANSWER: TROUGH

2. *CHEMISTRY Short Answer* How many atomic shells are occupied by electrons in the gold atom?

ANSWER: SIX

3. *MATH Short Answer* What is the name of the following formula $\int u dv = uv - \int v du$ (read as: the indefinite integral $u dv$ equals uv minus the integral $v du$)?

ANSWER: INTEGRATION BY PARTS

4. *PHYSICS Short Answer* Two resistors have the same power dissipated in them. The potential measured across resistor A is twice that across resistor B. If the resistance of resistor B is R, what is the resistance of A?

ANSWER: 4R

5. *BIOLOGY Short Answer* Blood is pumped into the pulmonary arteries by what heart chamber?

ANSWER: RIGHT VENTRICLE

1. *PHYSICS Short Answer* Who demonstrated that when heat is gained or lost by a system during some process, the gain or loss can be accounted for by an equivalent quantity of mechanical work done on the system?

ANSWER: JOULE

2. *MATH Short Answer* When will the geometric mean and the arithmetic mean for a set of n numbers be equal?

ANSWER: ALL THE NUMBERS ARE EQUAL

3. *EARTH Short Answer* What is the temperature at which air becomes saturated with water vapor called?

ANSWER: DEW POINT

4. *CHEMISTRY Short Answer* What gas has a density of 0.902 g/L at STP?

ANSWER: NEON

5. *ASTRONOMY Multiple Choice* Astronomers think that the inner core of Jupiter is composed mainly of

- W) Hydrogen
- X) Helium
- Y) Uranium
- Z) Rock and iron

ANSWER: Z) ROCK AND IRON

1. *MATH Short Answer* When solving systems of two linear equations by graphing, if the two lines are parallel, each with slope $-2/3$, how many solutions are there?

ANSWER: ZERO

2. *PHYSICS Short Answer* The force on a charged particle created by its motion in a magnetic field is maximum at what angle between the particle velocity and field?

ANSWER: 90 DEGREES (ACCEPT: $\pi/2$)

3. *GENERAL Short Answer* The study of how organisms interact with each other and their nonliving environment is called what?

ANSWER: ECOLOGY

4. *EARTH Short Answer* Which kind of volcano has no central peak or steep sides?

ANSWER: SHIELD VOLCANO

5. *ASTRONOMY Multiple Choice* The magnetic fields of Neptune and Uranus differ from other planets because

- W) they are both much weaker
- X) they are tilted far off of the rotation axis
- Y) they are both much stronger
- Z) they blink on and off

ANSWER: X) THEY ARE TILTED FAR OFF OF THE ROTATION AXIS

1. *EARTH Short Answer* What is the ability of a liquid to climb up a surface against the pull of gravity called?

ANSWER: CAPILLARITY

2. *COMPUTER Short Answer* In wide area networks such as the Internet, what is the general term for high speed, high capacity media such as fiber optic lines and microwave relays that are designed to transfer data over hundreds or thousands of miles?

ANSWER: BACKBONE

3. *ASTRONOMY Multiple Choice* Seyfert galaxies are

- W) active galaxies, most of whose energy is emitted by two widely spaced radio lobes
- X) elliptical galaxies whose nuclei resemble quasars
- Y) spiral galaxies whose nuclei resemble quasars
- Z) giant irregular galaxies which have neither spiral arms nor the smooth shape of elliptical galaxies

ANSWER: Y) SPIRAL GALAXIES WHOSE NULEI RESEMBLE QUASARS

4. *CHEMISTRY Short Answer* List the following elements in order of increasing ionization energy: Ar, Br, Te, Bi.

ANSWER: Bi ,Te ,Br ,Ar

5. *PHYSICS Short Answer* If a proton is released at the equator and falls toward the Earth under the influence of gravity, the magnetic force on the proton will be toward which of the four cardinal directions?

ANSWER: EAST

1. *BIOLOGY Short Answer* Absorbed fats are transported into the lacteals of which body system?

ANSWER: LYMPHATIC

2. *MATH Short Answer* In electromagnetism, what is the derivative, with respect to time, of the quantity of charge crossing a surface?

ANSWER: CURRENT

3. *CHEMISTRY Short Answer* What rule states that the major product in the formation of alkenes by elimination reactions will be the more highly substituted alkene?

ANSWER: ZAITSEV RULE

4. *COMPUTER Short Answer* What is the term used to describe the method used for defining a three-dimensional object by rotating its 2-dimensional outline figure 360 degrees?

ANSWER: LATHING

5. *PHYSICS Short Answer* The speed at which a wave propagates down a string is 250 meters per second. If the wavelength of this wave is 2.5 meters, what is the frequency of this wave in hertz?

ANSWER: 100

1. *GENERAL Short Answer* What is the term for agents of disease transmission?

ANSWER: VECTORS

2. *CHEMISTRY Short Answer* When used as a functional group in organic chemistry, the C=O group is called what kind of group?.

ANSWER: CARBOXYL

3. *ASTRONOMY Multiple Choice* The total luminosity of the Sun can be calculated from its

W) Rotation period and temperature

X) Diameter and distance from the Earth

Y) Diameter and the solar energy at Earth's distance

Z) Distance from Earth and the solar energy detected at Earth's distance

ANSWER: Z) DISTANCE FROM EARTH AND THE SOLAR ENERGY DETECTED AT EARTH'S DISTANCE

4. *EARTH Short Answer* Who was the first scientist to state the theory of continental drift?

ANSWER: ALFRED WEGENER (ACCEPT: WEGENER)

5. *COMPUTER Short Answer* In a spreadsheet program, a cell, a range of cells, or an entire file that prevents you from altering the contents is said to be what?

ANSWER: PROTECTED

1. *ASTRONOMY Multiple Choice* What is meant by the Solar Nebula?

- W) A cloud of hot gas in the Sun's atmosphere
- X) The cloud surrounding the Sun from which comets come
- Y) The rotating disk of dust and gas from which the Sun and planets formed
- Z) The glow of light we see around the Sun at a total solar eclipse

ANSWER: Y) THE ROTATING DISK OF DUST AND GAS FROM WHICH THE SUN AND PLANETS FORMED

2. *BIOLOGY Short Answer* Who discovered that heated amino acids formed proteinoid microspheres?

ANSWER: SIDNEY FOX

3. *EARTH Short Answer* What term describes the kind of desalination in which water is changed quickly into steam without boiling the water?

ANSWER: FLASH DISTILLATION

4. *CHEMISTRY Short Answer* What general term describes the process of hydrolyzing an ester under basic conditions to form a carboxylate anion and an alcohol?

ANSWER: SAPONIFICATION

5. *COMPUTER Short Answer* The forerunner of the modern hypertext system, this automated device was used for collecting and organizing scientific literature. What is it?

ANSWER: MEMEX

1. *ASTRONOMY Multiple Choice* Near the core of Jupiter, hydrogen is

- W) a low-temperature gas.
- X) a high-temperature gas.
- Y) a solid.
- Z) a liquid metal.

ANSWER: Z) A LIQUID METAL

2. *EARTH Short Answer* In which kind of climate does the average temperature for any month does not go below 18 degrees C (64 degrees F)?

ANSWER: TROPICAL

3. *BIOLOGY Short Answer* Cholesterol is a precursor to which vitamin?

ANSWER: VITAMIN D

4. *GENERAL Short Answer* What type of cytokine is produced by infected cells and limits the replication of viruses by limiting protein synthesis?

ANSWER: INTERFERONS

5. *CHEMISTRY Short Answer* What is the correct name for BrO_3^- (Read as: B R O three minus)?

ANSWER: BROMATE ION

1. *CHEMISTRY Short Answer* What is a column of elements in the periodic table called?

ANSWER: GROUP

2. *COMPUTER Short Answer* What is the term used to describe the terminal protocol that enables a user at a remote location to access a computer as if the remote computer were directly connected (hardwired) to the computer?

ANSWER: COMMUNICATIONS TERMINAL PROTOCOL OR CTERM

3. *BIOLOGY Short Answer* What is the name of specialized structures that anchor mosses to their substrate?

ANSWER: RHIZOIDS

4. *MATH Short Answer* The radix of a counting system or system of logarithms is another name for what?

ANSWER: BASE

5. *GENERAL Short Answer* What is the term for a closed depression in glacial drift created by the melting out of a mass of underlying ice?

ANSWER: KETTLE